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House Architecture.

THE book published under this title by Mr. J. J. Stevenson,* who has had a large practice in domestic architecture, constitutes, we may suppose, a kind of confession of the writer's professional faith. It is a tolerably extensive treatise, comprising in the first volume a consideration of the subject of architectural design as applied to house-building, the second volume being devoted mainly to planning and to practical considerations, and is supplied with a profusion of illustrations, many of which, in order to save the reader trouble in turning from one part of the book to another, are repeated in different parts of the two volumes, so as to flank the passages where reference is made to them,—a very great convenience to the reader.

We may be allowed to say that the volume dealing with the practical part of the subject seems to be very much the most useful of the two, and that it might have been a more logical arrangement of the subject to have made this the first volume, and thus to have considered in the first instance the part of house design which, as Mr. Stevenson, like every other practical architect, fully admits, comes first in order in solving the problem of building a good house, and then to have gone to the subject of the architectural treatment and expression of the same; though, no doubt, the first volume, with its numerous and picturesque wood-engravings, will be the most attractive to the majority of readers. We will, however, follow the author's own division of the subject, and consider the two volumes in their order of numbering.

In nearly all the various critical remarks which are interspersed throughout this volume we are disposed to agree; they mostly represent what may be called the common-sense view of the subject, and are, in fact, such as will hardly be disputed by any one, architect or amateur, who has given any serious consideration to architecture as representing the wants and tastes of the present day. In regard to this common-sense view of architecture there is, in fact, much less dissension of opinion now than there has been for a long time back among the minority who give any serious attention to the subject. A large proportion of the public, it must be admitted, are still as much at sea as ever in regard to what architecture really is, and what they want or expect from it. But it is something that the more thinking minority are to some extent agreed,—at all events, on paper; although the way in which their appreciation of common-sense principles will practically show itself in the style of building which architect or amateur respectively produces or demands, may differ widely in detail. One will consider that he gains his end by a modification and adaptation of nearly pure Gothic details; another, by the use of very impure and sometimes barely recognisable Classic details. It is, however, something if both are fairly agreed as to what they want, and that this is so to some extent is evident when we observe that a good many of the general critical views expressed by Mr. Stevenson, who is certainly not a favourer of Gothic architecture for domestic building, are really very much the same as would be put forth now by an architect wishing to recommend Gothic as the best starting style for house architecture.

Some few of these more general criticisms we may notice in passing. Taking the first volume as a whole, we should think that it rather wants compression and a general subordination to a special aim, that of exhibiting house architecture as it was historically, and as the writer thinks it may or should be at present. A considerable portion of the volume is devoted to a sketch of the characteristics, constructive and artistic, of Greek and Gothic architecture; though the tendency of the book is to show that Greek and Gothic architectural forms are of little or no use to the modern house architect. Some of the comments on both styles seem open to question, and are at variance with those of thoughtful and learned students of the respective styles, without any obvious reason. It seems strange to call the Corinthian capital a more logical form than the Doric; and in comparing it with the Doric in the same spirit, the real meaning and suitability of the Ionic capital, as a capital originally used between antæ, and therefore practically with one face (as shown in some of the rock-cut tombs of Asia Minor, which undoubtedly represent early Ionic originals), is overlooked. The Ionic capital becomes troublesome and unsuitable in design when it is used at angles where both faces must be equally prominent; in its original use it is as suitable as possible to its position. The difference between the Pæstum temples and the complete Doric of Athens, in regard to refinement of detail, is certainly underrated. In speaking of Gothic architecture, it should have been mentioned that if the pointed arch began in the roof in France (which we doubt), it unquestionably began in the ground-story in England. The illustrations of vaulting, &c., are, though few, well chosen, and calculated to render the subject intelligible; but we cannot see the force of the reasoning by which the author opposes the views of Sir G. Scott and other authorities on Gothic architecture as to the statical origin of the pointed arch; and he has strangely overlooked what others have said and written on the subject of Gothic architecture, or he would certainly not have put forward as "new" the suggestion as to the real formative cause of the fan-vault, as a means of getting rid of the varying lengths and curves in the vaulting-ribs (p. 160). This is suggested in so old and well-known a treatise as Professor Willis's celebrated paper on the vaults of the Middle Ages, more than thirty years ago. It has been repeated, originally or at second-hand, by several other writers, and was demonstrated last year to a general audience in a well-known London lecture-room, in nearly the same words and with almost the identical diagrams here used by Mr. Stevenson.

All this, however, has little or no connexion with house architecture as the subject is understood by Mr. Stevenson. He points out that, as every one must agree who considers architectural styles relatively to climate, material, and customs of living, Greek architecture is entirely unsuited for adoption here; at any rate, without so many modifications as would hardly leave it Greek at all. We are less able to adopt the writer's wholesale condemnation of Gothic as a modern house style. That it has usually been a comparative failure we admit; but this has not been so much from inevitable conditions of climate and material as from the employment of mere imitation instead of adaptation of the essential qualities of the style. Mr. Stevenson seems to recognise this in his remarks on p. 179. "To the earlier development of the old Gothic architecture belongs," as he truly says, "the "almost singular merit of perfect truthfulness. When a form ceased to have meaning, it was frankly given up" [there *are* exceptions to this, however]; "people did not, as in most other styles, weakly cling to the dead carcass. Instead of the ignorance and darkness usually attributed to the Middle Ages, there is a freshness and independence of thought rare in the history of humanity,* and a wealth of artistic conception employed in making every new necessity beautiful, which few races have possessed. If we could but do likewise, the result of working on the principles of Gothic architecture would be something very different from Pointed Gothic." This is quite true; but as the attempt hardly has been made, it seems premature to denounce the method of architecture usually called Gothic, until it has been fairly tried whether on the basis of such a method something satisfactory, suitable, and architecturally picturesque and truthful cannot be produced.

It is more to the purpose to notice what Mr. Stevenson has to suggest to us positively in regard to what house architecture may be, than negatively in regard to what it cannot be, or what it is not. In reference to this latter subject, there is a great deal of ridicule of existing taste or the want of it, in regard to which we

* House Architecture. By J. J. Stevenson, Fellow of the Royal Institute of British Architects. London: Macmillan & Co. 1880.

* The author here seems to be confounding the general intellectual character of the Middle Ages with their architectural character. The charges of "ignorance and darkness" are made against that period of history usually by writers who are not thinking mainly, or at all, of architecture, but of the general state of mental culture and enlightenment.

may observe that, like such criticism generally, it is somewhat pessimist and overdrawn, and that nothing is so easy as to "show up" the ridiculous side of anything,—architecture, dress, or whatever else it may be.

In a great deal of what is said in the chapter following the introduction, and headed "What constitutes good Architecture?" we entirely concur. It might, perhaps, have been made more effective on the minds of general readers if the opinions and principles expressed had been framed in briefer and more concentrated language, and more systematically arranged. Readers accustomed to think of and criticise architecture of course follow the author easily enough, but the people who have so little knowledge of the subject that this chapter would really convey new information to them, require to have such reasoning on the right or wrong of architectural style laid down for them in the very plainest and most perspicuous manner to give the slightest hope of their taking the trouble to follow the author's meaning, or even understanding it if they do. The main difference between architecture and engineering is well summed up in the remarks in regard to "proportion" in architecture, which Mr. Stevenson defines as finding expression mainly "in the relation of solids to voids,—of the supported parts to their supports. It does not look at the problem involved merely from a constructive or engineering point of view, asking, will the building stand? but, Does it stand with ease and grace? The building must not only be secure, it must look secure. To attain this result, a strength beyond mere constructive exigencies is often required"; and some illustrations of palpable defect in this kind of proportion of construction are given, such as a non-architectural reader may readily appreciate. In this sense of the use of the word "proportion," it is not difficult to attach a clear meaning to the word, and even to decide, within certain limits, what is good proportion and what is not. When, however, proportion is used in what the author makes its secondary sense (but which is the sense which the word usually has to most minds), as meaning the relative heights and widths of different features, and the combined effect, in regard to length and breadth, of the whole façade of a building or of its perspective dimensions, all possibility of defining proportion, or even of expressing in what it consists, is lost; it becomes a vague quality appreciated by the instinct of the eye of the designer and spectator. The attempt to make it on mathematical principles Mr. Stevenson dismisses as an illusion; but he cites as a common means of attaining proportion in the parts of a design, the subdivision of a building into spaces by lines and mouldings, giving emphasis where it is wanted; and in illustration of this he gives the engraving of the two houses at Münster (No. 1 of the illustrations which we reproduce), as showing the effect upon proportion of the horizontal and vertical division of spaces respectively. Here there seems some confusion of ideas. What is produced by a predominance of vertical or of horizontal lines is not what we should call proportion, but *character*,—a most important element in architecture, and which arises mainly from the predominance throughout a design of a leading idea or method which is emphasised as well in the larger and the smaller details. Character means that the architect has a fixed bent in the method of his design, to which it is all subordinated, and which is strongly and forcibly accentuated. In this respect the upper portion of the house on the left of the illustration has very marked character, but the whole is deficient in character; it contradicts itself, and so does the other house in the illustration, which is a jumble of incoherent and contradictory elements. In an old building, which has been obviously erected piecemeal and under the influence of varied tastes, there is no doubt a character derived from these very irregularities, which are historically interesting, and which are more or less blended also by the influence of time and weathering; in a new building they would be simply incongruities showing that the architect had no sense of the fitness of things, and no definite aim in regard to style and expression. In regard to the manner in which upright and horizontal lines are to be obtained, the author is content with a laxity of principle which it is very unadvisable to assert formally and deliberately, however circumstances may palliate it in practice. He observes that in the right hand or horizontal house the vertical lines take the form of Classic pilasters; and he defends this use of the feature against the strictures of Mr. Fergusson and others, evidently regarding it as a useful means of enforcing the vertical line when required. It is no doubt a useful means,—when the architect cannot or does not take the trouble to invent something more suitable. But, wide as the acceptance of the Classic pilaster as an ornament has been, it is, nevertheless, a makeshift. We may admire a great many buildings in which it is introduced, but there always remains the question whether they would not have been still more admirable if the same general grouping and effect had been obtained in some less conventional manner than by the misapplication of a feature originally designed as a part of construction. In regard to one or two other remarks in the same chapter, we may say that we are glad to see that the author recognises the fact that symmetry is as much a characteristic of the most impressive and stately architecture in Gothic as in Classic design. On the other hand, his idea about harmony in architecture, as consisting rather in identity of feeling than in form or style, is more than doubtful. To say that "the quaint old Classic screens and tombs, the grace of Inigo Jones, and the elaborate richness of Grinling Gibbons are in better keeping with the old buildings than the modern Gothic, which has, alas! so often supplanted them," even if it be true (which it certainly is not in all cases), is beside the question. The suitability here merely consists in the fact that old things look better in keeping than old and new; time has harmonised them; but that has nothing to do with architectural design. But it is a peculiarity of the school of architects which Mr. Stevenson represents, that they seem studiously to ignore all idea of there being any value in architectural completeness of style for its own sake and on artistic grounds. How entirely Mr. Stevenson is without this sense may be judged from the fact that he actually urges that the Late-Gothic porch planted in the middle of the great central arch at Peterborough is an improvement to the design of the whole, and even suggests that it was added consciously for this object. After this it is hardly worth while to argue the point.

In the chapter on the "Conditions necessary for producing good Architecture," more emphasis might have been laid on the hurried nature of modern life as one of the circumstances adverse to the production of good architecture. It appears to us that this is one of the most important of all the influences which fight against architecture at present. One reason why many buildings which were erected in a period of bad and corrupt architectural taste, such as the City churches of Wren, produce still so striking an effect, is not only that they have, in spite of bad detail, very fine qualities of design, but that they have a massiveness and solidity of construction which we find in few modern buildings. And the same with many of the old country-houses of the Jacobean and Queen Anne era. They are prim and dull in taste and style, but they impress us as built to last for many generations. In the present day wealth goes so rapidly from hand to hand, and social changes seem to follow each other so quickly, that few people think of building a habitation to last for generations of descendants in the solid and enduring manner which we find in the old houses. The same kind of hurry renders it impossible to give the requisite time to great buildings; they must be had at once, designed and built in a hurry; and these are not favourable conditions to the production of great architecture. The chapter goes over a good deal of ground which has been gone over before. In combating Mr. Fergusson's view that the best architecture has always been produced unconsciously and as a national taste or habit, the author draws what seems the necessary deduction from Mr. Fergusson's arguments, that the architect is only in the way; but whilst rebutting this idea, it certainly seems that in other parts of this book he tacitly encourages and repeats it; since he dwells on the fact that not only can no architect understand all the styles the practice of which is now professed, but that an additional difficulty is thrown in the way by the fact that the workman does not understand the details of these styles, as he did when they were practised as the style of the country. The argument from this is what the author has before put forth, and we have before commented on,—that we should have a style which is the workman's vernacular. This is not so positively and directly laid down as a panacea in the pages of this book, but acquaintance with the author's previously-expressed views renders it easy to see what his meaning is. We can only say what we have said before, that the idea that because workmen are uncultured we had better have a style with details sufficiently commonplace to be on a level with the workman's capacity, seems the very oddest way of resuscitating architecture that has ever yet been proposed. One way in which the want of knowledge about architecture, and still more, perhaps, the want of general interest in and love of art for its own sake, in English society, operates in lowering architecture, is mentioned by the author; an influence which has been more active than perhaps is generally perceived. It is that, from the artistic point of view, the wrong men get the work in so many cases. "To hope," says Mr. Stevenson, "that architects should be judged by their power of producing good architecture, and should get work according to their capacity for doing it, would be to expect too much from ordinary common sense. . . . . Without an appreciation of the value of art for its own sake, and some real knowledge of it in the community, we cannot hope to see much good architecture. Until this comes about, architects will be selected for the qualities which their employers can understand, —energy and business habits, the faculty of writing good letters, plausibility and pleasing manners, and especially that power of inspiring confidence which makes employers feel themselves safe in following their advice and entrusting their purses in their hands, and skill in getting work to do, which by no means implies the power of doing it."

We cannot follow the author through his description of the styles and his sketch of the history of the Renaissance in England; the latter is well done. We may just remark upon the other illustrations of old houses we have selected from the number which adorn the volume. The second one is a rich assemblage of picturesquely incongruous details, many of which would, in a new building of the present day, argue a great want of good taste and refinement on the part of the designer, but which are harmonised by time and historic association into a picturesque whole. No. 3 the author has put into perspective from a published elevation; it serves to show how picturesquely Renaissance details may be treated in giving way to special circumstances which require a disturbance of the usual observance of symmetry in Classic buildings. The finish at the cornice is, however, very bad; there is not the slightest pretension of reason or explanation for the projections of the pilasters and the cornice carried round them; yet this kind of thing is deliberately copied in some modern houses, as if it were a beauty of style. The sketch of the little inn at Kriegshaben is a good example of character,—the character derived from a definite and special treatment. It arises here from the peculiar arrangement of placing nearly solid walls and a heavy arch entirely upon windows; just what gives the peculiar character to Venetian architecture, where the light stories are below and the heavy ones above; a kind of half-playful inversion of the proper order of things in building.

We shall return to the practical part of Mr. Stevenson's book, included in the second volume; but before taking leave of the first, we should like to express our curiosity and dismay in regard to the illustration stamped on the cover,—a house-front, not, as far as we noticed, alluded to anywhere in the text. Is it intended for a joke?

Proposed Building for City and Guilds of London Institute.—A letter was recently addressed by Lord Selborne (chairman of the Council), Mr. F. J. Bramwell, F.R.S. (chairman of Executive Committee), and Sir Sydney H. Waterlow, M.P. (treasurer), to the Prince of Wales, as president of her Majesty's Commissioners for the Exhibition of 1851, containing proposals as to the building on a plot of land fronting the Exhibition-road, South Kensington, of a central institution or college for advanced technical education, at a cost of 50,000*l.* and upwards, and undertaking to maintain the same fully fitted and equipped with all suitable appliances at an annual charge of 5,000*l.* per annum at the least over and above any fees receivable. It is now announced that the Executive Committee of the Commissioners of 1851 are prepared to recommend acceptance of the proposals made on behalf of the City and Guilds of London Institute.

SIR F. LEIGHTON'S NEW WALL PAINTING AT THE SOUTH KENSINGTON MUSEUM.

A MURAL painting, filling a lunette space, some 26 ft. long by 13 ft. high, in one of the principal courts of the South Kensington Museum, has, with the exception of some slight and unimportant details, just been completed in, we understand, a process called "spirit fresco," by Sir Frederick Leighton, the president of the Royal Academy. As compared in size with Raffaelle's "School of Athens," Sir Frederick Leighton's "Industrial Arts applied to War" is but a few feet smaller in area, whilst some of the figures in the foreground in this work are over lifesize, and therefore larger than any of those in the Vatican Lunette. Following precedent, Sir F. Leighton has arranged his figures upon varying levels. The interior of an Italian "Armourer's Yard in the Fifteenth Century" is shown; two or three broad, shallow, steps stretching across the width of the picture lead up to the flight of stairs placed in front of the heavy Italian Gothic gateway, crested with corbels and machicolations, which forms the central mass of the composition. On either side of it, but only a few feet above the level of the yard, project two parapeted platforms. Upon the left of these are men repairing or cleaning circular and pear-shaped shields. On a more remote terrace at the back, a woman is nursing her child; a little girl scrambles up steps leading to the upper part of the gateway. On the right platform are customers to whom banners are being displayed by attendants. Above and beyond, under a sky overcast with white clouds, rise in pleasant irregularity, houses and buildings, amongst which it is easy to recognise a tower reminding one of that of the Palazzo Vecchio and a reddened dome like Brunelleschi's on Santa Maria dei Fiore at Florence. The lines of these stately architectural details are occasionally broken up by the forms of lance-headed cypresses and rounded clumps of orange foliage, overtopping the massive masonry about the precincts of the armourer's factory. Portions of verandahs and pillars of buildings flanking the courtyard are shown. On the left, inside a storeroom for stuffs, is seen a foreman giving instructions to a journeyman. Seated in the yard, close at hand, is a graceful composition of some seven embroideresses at work upon jerkins and mantles. In contrast to the quietness of the gentle craft, one can imagine the din and clanking which issue from the smith's shop at the opposite side of the lunette, where some men with uplifted sledge-hammers are at work. Thus far we have but slightly indicated the surroundings of those prominent groups of figures which give the chief interest to the picture. Dispersed about the steps of the yard, straddling and posturing with youthful lissomeness, are the armourer's customers. From the splendour of their costumes, embroidered silk, and stamped velvet doublets or justicoats, white cloaks picked out with golden ornament, tight-fitting hose, quaint caps plumed, or small round skull-caps, these Italians, some fair, with natural flaxen nimbuses, others olive and dusky, with dark frizzled hair, might be members of aristocratic Florentine families. One, trying on a suit of fluted and gilded armour, is fatigued, and with a bored expression on his face is stretching his arms; a second twists his head to catch a back view of the fastening of his greaves, which a stooping artificer has strapped on to his leg; another supporting himself with outstretched hand against a pillar, bends backwards to feel that the spur on his raised foot is securely fixed to his heel. Through the great central gateway is seen a knight in his panoply, mounted on a caparisoned charger. Other figures descending or ascending the steps from the gateway to the yard, link together, as it were, the left and right sections of the chief figure composition. The right section comprises nobles examining arms, such as swords and ivory-handled steel cross-bows, or stirruped arbalets. A young noble glances down the length of a Ferrara blade; a second and third, bending the points of their swords on the ground, test the spring of the steel; another signor is the centre of a little knot of men scrutinising hilts and handles. Interspersed are friends who have accompanied the buyers, seemingly giving approval of purchases, or commenting upon defects of workmanship. To the front is a crouching smith, who has strewed at the feet of customers an armful of weapons. Further, on the right, crossbows are being inspected by connoisseurs of accuracy of sighting and weight of pull.

The variety of types of men, young and old, effeminate and brawny, of expressions ingenuous and crafty, of attitudes hasty and leisurely, is a source of pleasure without fatigue. The dignity of the composition is nowhere marred by rude movements, and a balance of light and shade is maintained with valuable effect. A tendency to that graceful lengthening of limb which distinguished Greek sculpture of the period of Lysippus may be detected in the figure drawing. The colouring is brilliant and voluptuous, reminding the spectator at one time of brightness seen in monumental paintings by early Tuscan painters, such as Benozzo Gozzoli and Sandro Botticelli; at another, of the richness to be found in those of later Venetian painters like Paul Veronese. There can be little difference of opinion that the work is, perhaps, the most important hitherto executed by Sir F. Leighton. His powers as a designer, a draughtsman, and a colourist, have been put forth with a felicity which displays his knowledge and appreciation of the poetical, artistic, and social elements of the Italian Renaissance. With these few remarks, we leave the mural picture of the "Industrial Arts applied to War," to discuss briefly a recent use of fresco in this country, and the special system of so-called "spirit fresco," adopted, as we believe, in the present instance by Sir Frederick Leighton.

Of processes for mural painting there are three or four which are well known to most artists. These are paintings in "tempera," "buon fresco," "fresco secco," and, of recent years, "water-glass." Tempera painting is the same as painting in distemper. The Pompeians used this method, which is as easy to use as ordinary water-colour. The colours are mixed with a vehicle such as that prescribed by Cennini in the fifteenth century, consisting of the white of an egg and some cuttings from the top of a fig-tree, properly compounded together. "Fresco secco" dates earlier than "buon fresco," and is easier to deal with. The surface to be painted in "fresco secco" is of plaster finely ground, skilfully mixed, and then affixed or "floated" on to the wall or space destined for decoration. When this plaster coating is dry, it is rubbed smooth, and the painter damps those parts of it on which he is about to paint in colours mixed with lime-water. The entire plaster surface to be painted is before him for use as he pleases; this, however, is not the case with "buon fresco." That method demands more skill. The painting has to be executed in portions, and upon wet plaster. Each portion is applied to the wall or surface from day to day. The artist has to complete his painting on each portion before the plaster is dry.

"Some ingenuity," says the late Sir Charles Eastlake, in his work on Painting, "is necessary to conceal the joinings of the several portions. It is generally contrived that they shall coincide with lines in the composition, or take place in shadows. Their existence is unavoidable, and these divisions in the patchwork (for such it may be called) of which all works of the kind must consist, are among the tests of 'fresco' painting properly so called." An aim of both sorts of fresco-painting is that the painting shall be made permanent by being absorbed by or combined with the plaster surface, or *intonaco*, to which it is applied. No special provisions for effecting such a combination are made in simple tempera paintings. In these, the tempera or distemper may peel from off the surface.

The invention of "buon fresco" is said to date from the fourteenth century. Italian artists have most extensively used it, so that the mural frescos in Italy form one of the largest and most important chapters in the history of painting. The luminous qualities and grand style of drawing and painting which have been obtained by the masters of fresco have constantly stimulated modern artists to attempt the revival of the process. But in spite of what it might have been felt were vast sources of instruction, such as the frescos at Pisa, Florence, Orvieto, Padua, and elsewhere, modern frescos in this country have not, as a rule, succeeded.

As is well known, the process of "buon fresco" was adopted for certain mural decorations in the Houses of Parliament, upon the advice of a Commission appointed in 1841, under the presidency of the late Prince Consort, for the purpose of inquiring whether advantage might not be taken of the building of the Houses of Parliament for the purpose of promoting the fine arts in the United Kingdom. The reports of this Commission, to which we have recently drawn special attention, contain much valuable information. Mr. Heath Wilson, then director of the School of Design at Somerset House, travelled in Italy, and made what appeared to be an exhaustive report upon tempera and fresco paintings. Mr. Dyce, R.A., who was one of the first artists to receive a commission to paint in fresco at Westminster, went to Italy and studied the works there. Some bits of *intonaco* from Giotto's frescos in Florence were analysed by Professor Hofmann. But with all this care, many of the frescos in the Houses of Parliament, after a short time, showed signs of decay. Whereas, as Vasari tells us, Giotto foresaw and took steps to prevent damage to his Pisan frescos by the saline moisture of the walls turned in the direction of the sea, our Commissioners and artists and professors in 1848 could not foresee, amongst other dangers to be avoided, that the ground for the Westminster frescos had only a limited power of absorbing the pigments laid on it. When the mischief was done, an expert, Mr. Wright, a chemist, was called in, who explained to artists that their practice of painting "successive coats of solid colour over the same portion of the ground must always end in disappointment." Again, the MS. of the monk Theophilus, and other later MSS. on painting processes, mention "yellow ochre" and "terra verte" as pigments to be safely used by tempera and fresco painters. But here, again, it was not imagined that modern compositions sold under these names differed from those of the fourteenth century. Old names are retained, but modern science fits them on to machine-ground and chemically different ingredients. Italian painters like Giotto, Orgagna, and Ghirlandajo were by force of circumstances obliged, in the practice of their art, to know the nature of their materials,—how to mix a good plaster, how to float a smooth *intonaco*, and how to make up their own paints. Nowadays, however, a painter is relieved from this drudgery (?) of the studio, and the colourman supplies his wants. Without depreciating this condition of modern painting, we are aware that an artist setting himself to use so special a process as "fresco" is at a comparative disadvantage. It is not the ordinary mode of giving expression to artistic conceptions, and the artist using it has to teach himself the many and delicate intricacies of the system. He has not the opportunities of an Italian fifteenth-century painter, who could resort to the workshops of his brothers and learn from them the art of fresco-painting practically and technically. Hence paintings in methods not thoroughly understood by artists and their assistants fail.

In Germany the condition has been somewhat different. Dr. John von Fuchs invented the method of water-glass fresco. At the suggestion of the late Prince Consort, the late Mr. Maclise, R.A., as our readers may know, visited Germany, and during a few months studied this process, which was employed by Herr Kaulbach and others in decorating the National Museum at Berlin and the Pinacothek at Munich. The effects so valued in "buon fresco" were obtainable in "water glass." A plaster surface, as in "fresco secco," was prepared, and the parts, before being painted on, had to be impregnated with water glass or soluble alkaline silicate. Mr. Maclise was converted to the merits of the process for permanence and for beauty; and in his report on the subject, published in 1861, he likens the effects obtained by means of water-glass to the "enhancing effect of a shower on the rose, dyeing its native hue of a deeper and richer tinge." In twelve years, however, the surfaces of Mr. Maclise's great paintings in the Royal Gallery at Westminster, the "Meeting of Wellington and Blucher," and the "Death of Nelson," were afflicted with a mouldy film or efflorescence. A committee of artists was at once called together by the First Commissioner of Works, and Mr. George Richmond, R.A., was authorised to adopt a process of rubbing or obliquely beating the efflorescence from off the paintings. The beating is described as being done "with slings of linen and wash-leather, with pads of cotton wool in them, swung obliquely against the paintings with all the force a man could give to a side stroke." The mould from both pictures was successfully removed. Nevertheless, the young process of water-glass painting seemed to be accompanied, like "fresco," with inherent dangers to itself. We come now to "spirit fresco."

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"Spirit fresco" claims immunity from risks of decay, arising from defective pigments, loosening of the intonaco, efflorescence, and other ills from which usual fresco processes are apparently inalienable, at least in this country; and this immunity is perfected for mural painting in "spirit fresco," by its drying with a dead surface. Its invention is due to Mr. Gambier Parry, by whom a specimen was first exhibited in the International Exhibition of 1862. The Fine Art jury highly commended it for transparency of effect and deadness of surface; but being misled by reference to a medium used by M. Flandrin, the great French wall-painter, no more was then said about it. M. Flandrin's medium was a compound of wax mixed with copal, not prepared with oil (as commonly), but with spike lavender.

But "spirit fresco" is not a medium, but a complete process, from the first preparation of the wall to the last touch of the artist, and its whole excellence depends on that process being completely followed. It is very simple. Its great purpose is the complete union of the pigment laid on with the painter's brush with the wall itself. This is accomplished in this way. The plaster, which must be perfectly dry and porous, is saturated with the same material as that with which the dry powder colours are rubbed up, and by using oil of spike as a vehicle (as a water-colour painter uses water) which is a perfect solvent of all the materials used, the colours become entirely incorporated with the material, which had already dried hard in the pores of the plaster. On the evaporation of the oil of spike, the surface dries dead. The plaster should be good common stucco, and allowed a year to dry. There is no flaking or chemical efflorescence in this, as is frequently the case with cement. Cement should on no account be used. Where the whole process has been carried out the surface is as hard as marble, and quite smooth, so that nothing can adhere to it, and it may be cleaned at once with a feather brush. A still further advantage of this process is that any, even the most delicate vegetable colours, such as the madders, may be used, because there is no active chemical material in the compound used. It is made by boiling 4 oz. of pure white wax in 2 oz. (liquid measure) of turpentine, with 2 oz. of Elemi resin. Strain these through muslin into 6 oz. of oil of spike and 20 oz. (both liquid measure) of the finest preparation of artists' copal. Boil them thoroughly over a close stove (the materials being highly inflammable in a boiling state), then keep the compound in bottles of clear glass. With this the wall is saturated and the colours prepared. Want of space prevents us from giving fuller details of this process. It should, however, be added, that unless the whole process be carried out completely, which is well worth while, the two great *desiderata* for fresco painting which this system is supposed to insure, viz., perfect durability and a dead surface, cannot be expected. It is also absolutely necessary that the surface should be left by the painter perfectly smooth, to insure it from accumulation of smuts and dust, ruinous to the effect of colours.

Mr. Maddox Brown has used and is using "spirit fresco" for his decorative work at Manchester in the town-hall. Mr. Gambier Parry himself has painted a large part of the interior of the church at Highnam Court, with ecclesiastical subjects done in "spirit fresco." He has similarly painted St. Andrew's Chapel in Gloucester Cathedral. Some of these examples have been done for many years. Their appearance is uninjured, and is as fresh as when they were first painted.

Without some good reason to the contrary, which we confess we cannot see, it must be regretted that the plaster ground of Sir Frederick Leighton's lunette at South Kensington Museum is of a coarse texture. Each grit of the surface will serve as a lodgment for particles of dirt and dust. The surface where the system of "spirit fresco" is adopted should be hard as marble, and quite smooth, such as might be cleaned with a feather brush. Has Sir Frederick invented a new process? If so, it would be interesting to know wherein it differs from Mr. Gambier Parry's "spirit fresco." In the meantime, and subject to correction, we feel it incumbent upon ourselves to express sincere regret at what we cannot but construe into an incomplete understanding and appreciation of "spirit fresco."

Sir F. Leighton has designed a composition of the best Grecian period, entitled the "Arts of Peace," which has been exhibited as a pendant to the "Industrial Arts applied to War." If this is to be painted in "spirit fresco," we hope that our present observations will tend to insure for it a properly-prepared ground. Apart from the injustice done to the reputation of a process by using parts of it only, results of artistic labour which will cost the country some thousands of pounds should not be jeopardised.

We are forced to add the expression of another regret, in spite of, or rather because of, our admiration of much of the picture,—a regret that the situation of the picture is such that a proper view of it, as a whole, can nowhere be obtained; the passage or gallery, at the side of which it is placed, being so narrow that it is impossible for the spectator to take a right position for viewing the work.

REPORTED DIFFICULTY IN THE ST. GOTHARD TUNNEL.

We must receive with all due reserve the intelligence, communicated by a telegram in a morning paper, to the effect that the masonry lining of the St. Gothard Tunnel is being crushed under the superincumbent weight. Such alarming, and, as it has proved, utterly unfounded, reports, have from time to time found credence, for a few hours, of disasters in the Alpine tunnels, that we may well hesitate before arriving at the conclusion that a difficulty of a kind hitherto unprecedented has here made its unwelcome appearance.

In the United Kingdom, the chief obstacles that have delayed the construction, and increased the expense, of railway tunnelling, have been water and quicksand. In 1834, encouraged by the successful abandonment of the invert in the Watford Tunnel through solid chalk, Mr. Robert Stephenson sanctioned a similar change in the execution of the contract designs for the tunnel through Primrose-hill. It soon appeared, however, that although the London clay was so hard as to require the use of the pick, it did not cease to preserve the character of a semi-fluid. What miners call "creep" made its appearance. The finished bottom of the excavation cracked and rose; and had not the original design been resorted to, and the invert replaced, the whole bore of the tunnel would have been filled up by clay forced up from the floor by the incumbent weight on its sides.

Cases where arrisses have shown signs of fracture, and where brick arching in cement has had to be hastily employed, will be familiar to most engineers who have experience in tunnels. But the report to which we refer speaks of the crushing not only of brickwork but of granite by the St. Gothard incumbent weight.

The resistance of brickwork in cement to crushing power is given by Mr. D. K. Clark (at p. 631 of his valuable Manual of Rules, Tables, and Data for Mechanical Engineers) at ·232 ton per square inch. This is a low figure. The same table gives a resistance of 1·044 ton for stock bricks, and 3·100 tons for Staffordshire blue bricks. The resisting power of granite varies from 1·52 ton per square inch for Wicklow, to 4·87 tons for blue Aberdeen, and 5·86 tons per square inch for Newry. The weight of bricks averages under 100 lb. per cubic foot. That of granite ranges from 145 lb. to 185 lb. per cubic foot. A column of the former, 1 in. square, will thus weigh ·7 lb., and one of the latter from 1 lb. to 1·25 lb., per foot in height. Thus it may be said that a brick column might be erected to the height of 740 ft. of ordinary bricks, and of four times that height of stock bricks, without danger of crushing; while for granite a height of 3,000 ft. would not overcome the resistance of the Wicklow stone, nor that of 9,000 ft. that of the Aberdeen.

It is clear that the cases must be rare, if not impossible, in which the mass of earth over the roof of a tunnel can be regarded as if it exerted a direct perpendicular pressure on the masonry. The stratification of the earth tends to distribute the weight. We find that in December, 1877, the vertical depth of rock over the heading of the St. Gothard tunnel was 1,057 yards. The account given in vol. lvii. of the "Minutes of Proceedings of the Institution of Civil Engineers" is, unfortunately, not accompanied with a map. But it can be hardly doubted, from a comparison of the resistance above quoted with the depth cited, that the idea of the crushing of a substantially-built arch of granite by the sheer weight of the mountain is not one that is highly probable. By the end of 1878 the temperature at the face of the work had risen from 74·62° Fahr. to 84° Fahr. But if the whole of this increase be attributed to the extra depth of the mass of rock above, it only adds less than one-fourth to the height of 1,057 yards.

The strata pierced have been calcareous rock, gneiss, mica schist, and hornblende. Water has been found, the flow amounting to from 3,000 to 3,600 gallons per minute. There can be little doubt that the journal of the operations must contain much that will be of great value to the engineer. But that a limit of his work has been imposed on him by the sole agency of gravity, we must have some better authority than that of a telegram before we are prepared to admit. News of so startling a nature is rather calculated to frighten the Stock Exchange than the engineer.

FORFEITURE OF LEASES.

It is seldom that a newspaper correspondence bears such rapid fruits as that upon the forfeiture of leases for breaches of covenant, which has recently taken place in the *Times* and other daily journals, has done. But there is a great difference between bringing a Bill into Parliament and passing an Act which is the substantive law of the realm, and we anticipate that when Mr. Marten's Bill emerges from the Committee of the House of Commons to which it is destined, it will present a very different shape to that in which it may now be read. As it at present stands, short as it is, it seems to be decidedly too sweeping in character, but as it is a Bill which so vitally affects many of the readers of this journal, we insert here the principal clause in order that the proposed law may be seen as Mr. Marten desires to place it in the statute-book.

Section 2 runs thus:—"In any action or proceeding in which the Court is asked, whether by claim or defence or otherwise, to give effect to any proviso for re-entry or other stipulation by way of forfeiture for breach of any covenant or engagement in any lease or agreement for a lease, whether such lease or agreement be in writing or verbal, the Court may inquire into the case, and may refuse to give effect to such proviso or stipulation, and may relieve against the forfeiture; and such refusal and relief may be either absolute or upon terms as to making good any defect of repair or other defect, paying costs or damages, or preventing a future breach, or as to any other matter, according to what shall appear to the Court to be just and reasonable under the circumstances of the case." Then Section 3 provides that there shall be no forfeiture for non-preparation of assignments or under-leases by the lessor's solicitor; and Section 4 is to the effect that when several tenants hold under the same lease, they shall be mutually entitled to require that each tenant shall observe his covenants. This is, in effect, the whole Bill,—one not very clearly worded, and one, as it seems to us, too absolute in its character.

As the law stands at present, the Courts can relieve against forfeiture in two instances,—in cases of non-payment of rent, and of not insuring against fire. The first of these exceptions to a general rule has long been recognised by Courts of Equity, and both are found formulated in the statute-book.

The principle on which the first of these exceptions rests can, perhaps, be shown most plainly and most briefly by quoting the words of Lord Eldon in a judgment delivered in the year 1811, in the case of Hill *v.* Barclay (18 Vesey, 56):—"The Court," says the Lord Chancellor, "has very long held in a great variety of cases that in the instance of a covenant to pay a sum of money the Court so clearly sees, or rather fancies, the amount of damage, arising from non-payment at the time stipulated, that it takes upon itself to act as if it were certain that giving the money five years afterwards with interest, it gives a complete compensation. . . . . The Court has certainly affected to justify that right which it has assumed to set aside the legal contracts of men upon the notion that it places them as near as can be in the same situation as if the contract had been with the utmost precision specifically performed."

Obviously, however, the great Tory Chancellor, though obliged to follow the precedents of the Court over which he presided, had no particular liking for the doctrine which he had to enforce. But the principle, as he sarcastically expressed it, is simple enough, and, as it seems to us, fair and just enough. If A, the landlord, proceeds to bring an action of ejectment for non-payment

of 50*l.* rent, and B, the tenant, though the covenant of forfeiture entitles the landlord to turn him out of the premises, offers him the money, with interest, from the time from which it was due, it becomes clear that by obliging him to take it, and not enforce the forfeiture, he is fully compensated. And this principle has been also recognised in an Act of the present reign (23 & 24 Vict., c. 126, s. 1), passed in 1860, as well as in one passed some years before. The first section of this Act expressly enacts that by certain proceedings of a summary character any Court may relieve from forfeiture on payment of rent and costs within any reasonable time after execution has been issued, following the practice of the Equity tribunals. The same statute, too, gives the same relief in cases of a forfeiture for breach of a covenant or condition to insure against loss or damage by fire. This was only giving to the Common Law the power which had been extended to the Equity Courts in 1859, before which date they would not help the tenant in this respect, as had been decided in 1817, except where there had been some kind of fraud on the part of the lessor.

We have made this brief, and we hope not too technical, mention of the existing law on the subject, because it is well that it should not be supposed that this modification of contract between a lessor and a lessee is a new kind of doctrine. With regard to the covenant contained in so many leases that the deed of assignment or sublease should be prepared by the lessor's solicitor, that may be safely allowed to lapse; but we confess that it seems to us that this is a point which a body like the Incorporated Law Society should take up, and not the Legislature. It is a matter wholly and solely concerning the interests of the legal profession, and if the Incorporated Law Society were to set its veto on solicitors preparing such a covenant, it seems to us that this evil would be cured, if lessees also take care that it is not mentioned in future deeds. But as regards the forfeiture of leases by nonperformance of covenants generally, there can be no doubt that paternal legislation such as is proposed is, in theory, objectionable. Contracts between man and man should be strictly observed. When a man enters into a contract he should do so with a full knowledge of the obligations under which he places himself, and a determination to abide by them. On the other hand, under the pernicious system of ground leases and secondary leases by the tenant of the ground landlord, the actual occupier of a house may lay himself open to be ejected because of a default in some covenant by the original lessee; for, says the chief work on the law of landlord and tenant, "the original lessor may distrain for rent or evict the sub-lessee if the lessee has incurred a forfeiture. But any absolute refusal to give effect to the proviso for re-entry, as proposed in Mr. Marten's Bill, appears to give too large powers to the law courts; because, if gross negligence has occurred, why is a lessee to be absolved from the results of conduct which in no other contract he would be freed from? The real principle on which an enlargement of the present powers of the Court should be based seems to be that where the lessor can be compensated by money damages,—where he can be placed in exactly the same position as if the breach of covenant had not taken place,—then that the Court should in that case relieve the tenant from the consequences of a breach of the covenant. If the damages are nominal, then the well-known one farthing should be given; because, for example, suppose a window made in a wall without a license, and a forfeiture in consequence insisted on by a churlish landlord. Clearly it might be that the property had been benefited by the act in question; but why should not the lessee do as his lease stated, and request permission? But it would be obviously a hardship if a tenant were, in consequence of such an act, turned out of a house. On the other hand, it is quite fair to argue that if the landlord does not wish to have a new window it should not be put in against his wish, and therefore there should be a power in the Court to order things to be put in the same state as before the breach; for, to continue this same instance, the tenant might otherwise, contrary to his covenant and his landlord's will, obtain his window at, it is true, the cost of legal proceedings. But it is better that some hardships should press on tenants than that they should be able, with comparative impunity, to do whatever they like with the landlord's property. It is, therefore, very satisfactory to know that the present sweeping measure will receive modifications in the Committee to which it will be sent; but it cannot be too strongly insisted on that hasty legislation, and legislation which modifies contracts made between competent parties, is not to be regarded with favour. That some additional powers may reasonably be given to the Courts, we do not deny, but such powers must be carefully considered before they become law; for there is nothing more detrimental to the general security of property than tampering with contracts, which are agreements solemnly entered into after thought and consideration between competent parties. The Bill introduced in the sessions of 1876 and 1877 contained elaborate safeguards for the landlord, and recognised much more thoroughly than the present Bill the necessity for touching this matter in a cautious and deliberate spirit, and it is upon the lines of the previous Bills that legislation must be framed rather than on Mr. Marten's superficial attempt at legislation. The Bill introduced by the Lord Chancellor on Monday last will probably effect all needful reforms when it has been well discussed in committee. The principle of this measure is that which we have indicated as the proper one,—that the landlord shall be placed in the same position as before the breach, which Lord Cairns proposes to effect by enacting that the landlord shall give the tenant notice to remedy the breach, and if the tenant does not do so, then that the landlord may make use of his power of ejectment, subject to the right of the lessee to apply to the Court for relief. But the provisions are not to apply to any covenant against assigning or subletting without licence. This reservation is clearly a proper one, because otherwise a landlord may find himself with all sorts of bankrupt or impecunious tenants on his property. The real relief to tenants will be the obligation on the landlord to require the tenant to remedy his breach of covenant; and we should almost be inclined to say that if the tenant has this opportunity, any interference by the Court is scarcely necessary, and should be guardedly given. At any rate, the Lord Chancellor's measure is in all points superior to that of Mr. Marten.

THE BOARD OF TRADE ON THE NEW RAILWAY BILLS, &c.

THE Report by the Board of Trade upon the several Railway, Tramway, Gas, and Water Bills which are to be investigated during the present Parliamentary Session has been issued. From this document it appears that the total number of Bills of this description is 172, and that the proposed capital required for carrying out the works amounts to 31,042,940*l.* The number of Bills which relate to railways is 100, of which 59 are promoted by existing companies, for the construction of 181 miles of additional railways and other works, the proposed capital for which is 6,460,792*l.* This additional mileage is mainly in England, namely, 155 miles, whilst in Ireland the proposed extension is 23 miles, and in Scotland only 3 miles. The number of Bills promoted by new companies is 41, for the construction of 455 miles of new lines; 306 miles being in England, 79 miles in Ireland, and 70 miles in Scotland, the proposed capital for which is 13,612,698*l.*; the total length of additional railway by the two classes being 636 miles, and the capital proposed, 20,073,490*l.*

The tramway Bills are 25 in number, for the construction of 124 miles of tramway, at an outlay of 1,468,300*l.* In addition to the above there are 35 applications to the Board of Trade for Provisional Orders for the construction of 122 miles of tramway, at an estimated cost of 605,173*l.*

With respect to gas and water, there are 47 Bills, of which 24 relate to the supply of gas only, and three to the supply of gas and water. The total sum proposed to be raised under these 47 Bills amounts to 9,501,150*l.*, of which it may be observed that upwards of one-third of the entire sum,—3,250,000*l.*,—is in respect of the Bill promoted by the corporation of Liverpool for obtaining a supply of water from the rivers Vyrnwy, Marchnant, and Afon Cowny, in Montgomeryshire.

The Female School of Art.—The Baroness Burdett Coutts will distribute the prizes gained by students, in the Theatre of the University of London, on Monday, March 1st.

ARCHITECTURAL LECTURES:

BY THE LATE PROFESSOR E. M. BARRY, R.A.*

ARCHITECTURE ALLIED WITH COLOUR.

I HAVE thus far confined my remarks to the application of colour to external architecture, because, with reference to interiors, no doubt can exist as to past practice; or of the indispensability of colour allied to architecture if the latter is to put forth all her powers. In the cheerless countries of the North, brightness and cheerful colouring in our houses are more necessary than in places where men live to a great extent out of doors, and see more of the exterior of buildings than we do. It may be that, in the latter case, external polychromy is more reasonable than with ourselves, and that our own attempts to combine colour with external architecture should be subject to considerable limitation. With reference to interiors, however, there can be little doubt that one of the chief studies of the architect should be how to apply colour to his work artistically and reasonably without sacrificing the more strict architectural principles of design. This use of colour to heighten architectural effect is, in fact, one of the most legitimate weapons in the hand of the modern architect in his warfare against the bare coldness of interiors which used to be thought "Classical," and the depressing monotone of "churchwarden's whitewash." If any evidence be required of the love of colour by Mediæval architects, it is to be found in the invention and use of stained glass. Before this period windows were few and small, necessary expedients for admitting light and air to the interior, but of simple design and but slightly accentuated by architectural treatment. In private houses they were seldom glazed, but were closed at will by means of shutters. When, however, stained glass came into use, its decorative effect in architecture was so evident, and became so fully appreciated, that the very forms of the architecture were modified in order to afford due opportunities for the display of this beautiful example of the application of colour. Windows now became, in fact, the chief decoration of the building both internally and externally; for though no effect of colour could, of course, be visible on the outside, the adoption of large windows led to the use of the elaborate tracery which is so characteristic and charming a peculiarity of Gothic architecture. Of such traceries, the great rose-windows of French cathedrals furnish striking examples; some of them, as at Chartres, being designed massively with purely geometrical forms, while others, as at St. Ouen, display the fancy of the designer for flowing outlines, with an intricacy of detail which, however wonderful, seems fitted rather for some plastic material than for execution in a hard substance like stone. Such windows, however, when filled with stained glass are very beautiful, and recall to the mind the charming effects of the kaleidoscope. In French architecture we trace more readily than in English the influence exerted on the architecture by the adoption of stained glass, for the enlarged clearstories so common abroad did not find equal favour in this country, where stained glass was more costly and less easily obtained. One result of the adoption of an enlarged clearstory was the development of height which distinguishes foreign cathedrals from our own. We all know, for example, how Amiens Cathedral stands up like a giant from among the buildings of the town. It may, however, be questioned whether undue height be not one of the worst defects from which architecture may suffer. In respect of the exterior, we miss in such buildings as Amiens the well-balanced proportions of the best English designs. Towers are dwarfed by the great height of the nave roof, and the buttresses become exaggerated by obtruding too forcibly their constructional functions. Great dimensions are always impressive, but even in such cases, exaggerated proportions in one direction involve a corresponding loss in others. If we take Salisbury Cathedral as a typical English example, we shall find that in it a well-contrasted proportion of its parts, all of moderate dimensions, enough to allow of due prominence being given to pinnacles and gables, leads up to the crowning effect of the exquisite central tower and spire. As an architectural composition

* See p. 213, *ante*. It is right to repeat that this lecture, which would have been the fifth in the Royal Academy series, although left apparently ready for delivery, did not receive final revision from its lamented author.

such a structure is far more satisfactory than the gigantesque attempts at enormous height. However beautiful, therefore, the great stained-glass windows may have been in themselves, their influence on architectural form was by no means an unmixed good, and even the interiors did not always gain by their adoption. Great internal height is, indeed, specially impressive in a church, as tending more than any other circumstance to remind man of his insignificance before his Maker. Nowhere do the worshippers appear so small and unimportant as in the great French churches. In an artistic sense, however, the too great height of an interior is a misfortune, as it impairs the effects of width and length, and thus sacrifices the idea of spaciousness. Inasmuch as the various proportions should bear a ratio to each other, and one of these being exaggerated will alter the value of another, as we see in the case of a room doubled in width by alteration without any increase of height. In such a case the effect of lowness will be produced, though no change has been made in that dimension.

I have dwelt somewhat at length on this part of my subject, not only because the question of proportion is of great importance, but also because the adoption of such changes in the forms of architecture as were made as described prove conclusively that love of colour on the part of the Mediæval architects was no less than that displayed by their predecessors in Classic times. It may be admitted that the art of much of the stained glass used by them was defective, but this only strengthens the argument in favour of colour, considered on its own merits alone. It was not every church that was fortunate enough to secure the co-operation of artists in painting, such as those who worked in the beautiful Italian Gothic church at Assisi. Here we find an architecture of pure forms decorated with paintings of high artistic excellence. The church is built in two stories, with nave, choir, and transept on each floor. On every part of the floor, walls, and roof, colour is allied to the architecture. Paintings by Giotto, Simone Memmi, and others of their school, make the walls eloquent of saintly acts and Christian virtues. Decoration of this order not only powerfully aids the architecture, but works hand in hand with the latter as a teacher. It was a decoration, not of marbles polished by mechanics, and arranged in geometrical order, but it was an application of art in its then highest development to the service of the sanctuary. Architecture, whatever its impressiveness, stops at a certain point, from which the painter may take up the sacred torch and expound upon his walls the deep things of life and point the way to heaven. To carry out such a work in such a manner calls at all times for sacrifice on the part of the artist. He cannot have the architecture made to display his paintings to the best advantages. He must, on the contrary, design his work with reference to the position it must occupy and the light it can obtain, which will not always be that which he might desire.

The domestic feeling prevalent in this country has perhaps been a stumbling-block to art. Our painters work with high finish for small circles of appreciation. The days when a great painter, surrounded by his assistants and pupils, would undertake a grand application of colour to architecture in the spirit of Giotto and his school have passed away, and it would almost seem that this great desideratum is altogether ignored by the apathy of our public men in regard to art. If it were otherwise, there can be no reason why in this rich country our people should rest satisfied with an architecture of bare walls, or hand them over for colour to the decorator and paperhanger. As we look around the rooms of the Royal Academy, and observe the great spaces, which are never covered with pictures for exhibition, and the bare ceilings and undecorated walls of our official rooms, the question arises whether the Royal Academy might not in its own house show some practical appreciation of the doctrine of the association of the arts of painting and sculpture with architecture. Giotto, while designing architecture with the eye of a painter, never forgot his architecture in his painting. His works charm us by their directness and the simplicity which were necessary in appeals to men who could not read. These had to be taught through the eye, and their feelings and consciences to be stirred by direct representations. These conditions do not, of course, exist among ourselves, and the lessons which Giotto taught with plainness of artistic speech would possibly fail to touch modern society. Surely, however, the latter need not, therefore, be insensible to the employment of the highest art attainable in our public buildings, both civil and ecclesiastical. As to the latter, there will always be divergences of opinion founded on differing theological views, and objections will be urged which, being founded on religious principle, will command respect, though they may fail to obtain our assent. Admitting, however, to their fullest extent the danger of touching holy things with hands not always pure or strong, an age which tolerates windows full of sacred subjects, often, but too ill drawn and composed, might surely turn its attention sometimes to a high-class mural decoration, and encourage our best painters, who, I feel confident, would readily respond to work, as did Giotto, in concert with the architect.

We have now seen that the alliance of colour with architecture has always been intimate, and it only remains for us to consider how far this connexion can be retained in our own work. And, in the first place, we may inquire as to the external colouring of our buildings here in England. We may, I think, at once dismiss any question of applying actually painted decoration to our external architecture, not only on account of its perishable nature, but also because although such surface brightness may be tolerable when toned down by the brilliant sunshine of Egypt or of Greece, it would be too apt to appear inappropriate and tawdry in our less favoured atmosphere. It is different, however, with colour constructionally applied so as to form a part of the actual structure of the building. Such polychromy is at least reasonable, always provided that the materials be selected in accordance with common sense. Thus, in contrasting red brick with stone, each should be used in their appropriate positions, for which their constructional qualities specially fit them. Terra cotta also should appear in its own character, and not as an imitator of other materials. Site and surrounding circumstances should also be taken into account in determining the question of colour in respect of architecture. A building of dark red may, for example, please when placed among the verdant foliage of the country, while it would appear dull and sombre in the smoke-laden atmosphere of London or Manchester. In all cases, however, a careful and restrained employment of coloured materials will enable the architect to emphasise his effects of light and shade, as, for instance, by using for recesses and panels darker materials than those of the general face of his work. The shadows of the cornice may be deepened by such means as at the Town-hall of Perugia, where the spaces between the cantilevers are filled in with a dark marble. Polished marble is a thing forbidden to us by our climate for external use. If we require similar effects, we are, therefore, practically limited in our resources to glazed pottery and granite. Pottery can give us beautiful tiles and bricks, but the former are more suited for internal than external use,—at any rate, on any extended scale. Tiles may perhaps be used sparingly in panels and spandrels, and such like positions, but they are open to all the objections of principle and construction which apply to all veneering applications of colour. Glazed bricks may, however, give a more satisfactory result. The difference between a wall built of white glazed bricks and large surfaces covered with tiles applied to the walls is all in favour of the former. This may be seen any day by comparison of walls built in the first method with the tile-covered surfaces of the station areas of the Metropolitan Railway. Now that bricks can be made with a beautiful surface of various tints, hard, dry, and durable, they may be reckoned by the architect as one of his most ready means of indulging in the experiment of external polychromy in towns, and it would be interesting to have some such experiment tried on a scale sufficient to test its merits. The costliness of granite must always make it a luxury to be used sparingly, as for doorways and places where there is much traffic and wear and tear. Such use of it is not only constructionally legitimate, but also affords points of colour on which the eye rests with pleasure. If, however, granite be applied to a whole façade, and yet so applied as not to give a general effect of colour, the result is unsatisfactory. The attached columns at the Carlton Club-house in Pall Mall are a case in point, and we can estimate their architectural value the better from the resemblance of this building to Sansovino's Library at Venice, where the columns do not differ in colour from the rest of the building. The granite columns appear isolated and spotty, marking a façade which should be governed by the horizontal principle with strongly-defined vertical blots. If the entablatures of the orders had been executed in a darker material, this defect might have been avoided and a more harmonious effect of colour obtained, but having regard to the nature of the whole composition, a more pleasing result would probably have followed the use of light materials for the columns and entablatures, with a darker construction for the windows and recessed portions of the front. While we may reasonably desire to enliven the too often cheerless streets of our great towns with the charms of colour in alliance with architecture, it must be confessed that the task is one of great difficulty, and I may perhaps caution my younger hearers against a fashion but lately become prevalent of dotting our buildings with little bits of polished granite or marble, applied without constructional propriety or any connexion with the architecture. Sometimes these so-called ornaments project in such a manner as to suggest instability, as when they assume the appearance of petrified cannon-balls stuck against the walls by means of some concealed agency, which may fail at any moment. The most important modern building, as far as I am aware, in which external polychromy on a large scale has been attempted, is the new Opera-house at Paris. As the architect is happily amongst us, being one of the foreign honorary members of the Royal Academy, I must abstain from any criticism of this remarkable work while commending it to your observation. You will find in it at least a public building carried out in a manner very different from the niggardly spirit which limits any such attempts amongst ourselves, and while you will decide impartially as to the praise or blame which may be due to it in your judgment, you will have the advantage of seeing an example in which the architect appears to have had full power to secure the additions of colour and sculpture to his architecture. One thing may at least be said without infringing the rules which forbid criticism of contemporary works,—a building should declare its purpose, and whatever may be the merits or demerits of the Paris Opera-house, no one could mistake it for anything else than what it is.

Another remark may also be made, namely, that we cannot conceive it to be possible for an architect to venture on a similar attempt in London as long as we are contented to dwell in a smoke-laden atmosphere, full of dirt and of decay-producing influence on our architecture. It is idle to talk of colour in our buildings when we cannot see them, and to declare our appreciation of fresh air when we systematically poison it with the smoke and products of combustion from millions of fires. If science would help us, how many an artist's quarrel with her would be forgotten, for in a brighter atmosphere a more general appreciation of art would soon appear. As matters now stand, the task of the architect in large towns is disheartening in the extreme. Far from daring to think of any delicate application of colour, he has to face the fact that his building, before it has even left his hands, will be defaced by stains and patches of blackness. The machine-made ornament of the plasterer and the high-class bas-relief of the sculptor will be concealed by a dull uniform of sooty dirtiness. A building of my own, which a few years ago showed contrast of colour in red and yellow brick, only, as I half feared at the time, too pronounced, is now coloured with monotonous dirtiness in such a manner that no other colour is visible. Unless, therefore, our urban atmosphere can be purified, external polychromy is scarcely a matter within the practical sphere of English town architecture when employing the ordinary materials of usual construction. Polished surfaces, capable of being easily cleansed, might, as I have said, have a claim for consideration; but they will always be costly, and therefore only available in exceptional cases.

If, however, we must perforce admit this conclusion, we may all the more readily welcome the art of colour in the interior of our buildings. The general taste of mankind has settled the acceptance of such a direction in principle. No one wishes his rooms to be devoid of colour, or would sacrifice the hues carpets, curtains, and paperhangings give to any theory of the classicality of monotones. If the Greek and Roman architects considered their interior architecture imperfect until it glowed with colour, we cer-

tainly cannot afford to be more exclusively architectural; and if the best Mediæval churches were intended to have their architectural forms enhanced in a similar way, we need not fear to follow their example. The problem is unquestionably difficult, and success in solving it harmoniously very rare; but it nevertheless forms one of the most important duties which the architect should make his own. I may speak in the next lecture of some of the obstacles he may find in his path, but success is never glorious except when obtained by sacrifice. In the meantime, I earnestly plead with those who have the direction of public works to be satisfied with nothing short of the best art of the time. Public patronage is essential for the encouragement of high art. Neither painters, sculptors, nor architects can do their best unless properly supported. Men cannot paint great pictures for which no purchaser can be found, nor can either sculptors or architects develop their best energies when employed on a limited scale by private clients.

Last year I was glad to refer to a step taken in the right direction by the authorities of St. Paul's cathedral, by summoning to their aid two distinguished painters, members of the Royal Academy, and architects will await with interest the result of their labours. At South Kensington Museum artists are engaged in important mural works, displaying in their progress much the same spirit of self-sacrifice which has distinguished their predecessors. At Manchester, also, I believe the Corporation has risen to the occasion before them, given by the erection of their new Town-hall. Here, in London, our public authorities seem more apathetic. We have speeches at banquets on the importance of art, but to what results do they lead? We have municipal bodies with ancient traditions and great wealth. A tardily-manifested zeal, begotten of commercial depression, displays itself fitfully on the subject of technical education. Can nothing be done in the meantime to give that encouragement to art which can only be adequately afforded by public action? May it not be asked that some fraction of Imperial and municipal budgets may be devoted to purposes which may elevate the taste of the people, and so be advantageous, even from a commercial point of view, in strengthening the position of our country to face the competition of the world? These and other similar reflections press upon us in considering the alliance of colour with architecture.

We find the experience of the past pointing out to us in this matter the proper road to be followed, and wherever architects have the power to make their influence felt, it should be exercised in favour of the association of the fine arts. It is the special privilege of Architecture to assert a primacy which allows to her the position of a representative. Her work must not depend on Painting and Sculpture, for she cannot always command their services. On the other hand, architecture will never be exhibited in its most perfect form without such aid. By it the value of architecture will not be created, but it will be enhanced, and that position of perfection will be reached in which we feel that everything is lovely, everything in its right place, and that no detail, whether of form or colour, can be subtracted without an injury to the whole composition as a work of art.

FROM THE BANKS OF THE SEINE.

THE fact that here in Paris we have not such exhibitions as those which form so marked a feature of the London winter season, is undoubtedly due to the size and importance of the annual *Salon*, about which the artistic world on the banks of the Seine is commencing seriously to talk. The comparative absence of that exclusivism which is forcedly so marked a feature of our Royal Academy exhibitions,—an exclusivism rendered almost obligatory in consequence of the unreasonable number of works each member is allowed to send in, as also the limited space at the disposal of the Burlington House authorities,—has prevented almost entirely the formation here of any of those rival or malcontent schisms which afford the London public the pleasure of so many different exhibitions. The *Salon* absorbs all the schools, and by the large number of its exhibitors (no artist, even those in official positions, being allowed to exhibit more than two pictures), embraces the whole field of modern French art. The two or three exhibitions which are at present open in Paris must not be considered, therefore, as competitors, or independent of, the forthcoming official show; indeed, many of the pictures which are now being exhibited at the Place Vendôme and the Rue Volney we shall see again next May at the Palais de l'Industrie, while many of them again are old friends. These two exhibitions, as many readers of the *Builder* will remember, invariably precede the annual May show, and serve in guise of harbingers to the coming daylight of the summer splendour. Judging, however, from the effect of the slight rehearsal, as also from the general talk, there seems no great prospect that the *Salon* of 1880 will form a very brilliant epoch in the history of modern French art. From what we have seen of the pictures that are to be exhibited at the ensuing *Salon*, we are not likely this year to be startled by any extraordinary achievement of French artistic skill or erudition.

There is not likely to be any want of that felicitous expression which the French artists of the brush, like their friends the *littérateurs*, are so happy in, but we think it will be observed that commonplace and prosaic work will be more than ever in the ascendant, and that the effect of easy complacent teaching, without a watchful and sufficient regard to a well-directed aim, will be clearly manifest. Elaborate nudity and stagey dressiness we may expect to see in full force, and we anticipate that M. Gervex, whose lovely picture of "Rolla" was refused at the *Salon* two or three years since, is likely to secure this May a name which will abide for many a year in our memory of artistic triumphs. But we much fear whether M. Duez will equal his picture of last year, a picture which formed a conspicuous feature at the *Salon*, and which now occupies a place of honour at the Luxembourg, to be removed in due time to the Louvre, where it will be placed by the side of the Delacroix, the Troyons, the Decamps, and the Rousseaus, and the older modern French painters, whom, alas! in our ingratitude we are beginning already to disregard as teachers, and to look at with indifference.

That the French artists and their friends the critics admire each other with commendable determination, if not with a little too much exclusiveness, is perfectly evident to those who daily read the French amusing journals; but at the same time, there is much to be said in favour of mutual admiration societies. It must be remembered how much success has been achieved by the judicious management of well-planned friendly praise, and after all, next to youthful love and family affection, so says Oliver Wendell Holmes, there is no human sentiment better than that which unites the societies of mutual admiration; and what would literature and art be without such associations?

Not a month separates us from the date fixed for the admission of works to the *Salon*, which we may repeat, is, for pictures, &c., from the 8th to the 20th proximo, and for sculpture till the 29th proximo, and with the 1st of May the *Salon* will open its doors. Artistic Paris is, therefore, feverishly availing itself of the few fine days which are left,—an example doubtless being as diligently emulated on the other side of the Channel.

It is rare to find our French brethren acknowledging our superiority in any branch of the fine arts. As to the recent publication of a choice illustrated catalogue of the exhibition of drawings by the old masters, held last autumn, and of which the *Builder* spoke, M. Philippe Burty, in the *Républicque Française*, in speaking of the mode in which this work is illustrated, has regretted that the reproduction of the drawings is not so careful or artistic as that which Mr. Dawson skilfully executed of the Grosvenor Gallery collection.

In the death of M. J. P. Cluysenaar, not alone the professional world of Belgium, but that of the whole Continent, loses a representative artist. It was at the age of sixty-nine that M. Cluysenaar died, leaving behind him a reputation which makes his name familiar to the whole profession. His best claim to the gratitude of his fellow-citizens, in addition to his adornment of Brussels by the Marché de la Madeleine, and the Hôtel du Conservatoire, is undoubtedly the well-known Galeries St. Hubert, which he conceived, and executed some thirty years since, and which will long remain one of the masterpieces of its kind.

France also, within the last few days, has lost a distinguished engineer in the person of M. Leonce Reynaud, in his seventy-ninth year. His death was sudden; indeed, it is only a few days since he had handed over to his publisher the last proofs of a great work he had completed, "Les Travaux Publics de la France." A pupil of the École Polytechnique, M. Reynaud eventually entered the École des Beaux Arts to follow the profession of architect, but, after the Revolution of 1830, he became a pupil of the École des Ponts et Chaussées. In his long career, M. Reynaud has rendered eminent services in reorganising the lighthouse department of France, and the methods of which have since been adopted by England and many other countries. Among the works which M. Reynaud leaves, is a treatise on lighthouses, a treatise on architecture, and his "Travaux Publics de la France," to which we have above referred.

To architects and archæologists the recent discovery by M. Eugene Müntz of the accounts for the buildings erected at Avignon by the popes of the fourteenth century (between 1319 and 1370) cannot fail to be interesting. These accounts, discovered among the Roman archives, furnish minute details, not alone on the works executed, but also on the artists who were charged with them. M. Müntz proposes to publish these accounts in a series to be entitled "The Arts at the Court of the Popes during the Middle Ages," which will form a portion of his studies on a work to which reference has been already made in these pages, on the arts at the court of the Popes during the fifteenth and sixteenth centuries.

Piece by piece old Paris is doomed to disappear, and with the exception of a few rare relics of Middle Age architecture, there will soon remain scarcely a vestige of even seventeenth century Paris. Within a few days past an order has gone forth from head-quarters that the Place Dauphine shall be transformed into a square. Opening directly on to the classic Pont Neuf, the Place Dauphine scarcely retains, except to the observant eye, any traces of its old character, but till within only a few years this character was very marked. Its houses belonged to the period of the still intact Palais Royale, or rather, Place des Vosges,—red brick and white stone dressings, high-pitched roofs, grey-green slates, and prominent gables. But long since the exigencies of the late M. Duc's design for the Palais de Justice condemned the large end of the triangle, and what few houses still remain have been diligently whitewashed and painted long since; indeed, the stranger undirected might easily pass the old Place Dauphine unnoticed. Historically, the triangle is interesting as being a portion of the island on which Paris was originally built.

Among other artistic news, the arrival in Paris of Patti and Verdi is a coincidence of some interest. Patti comes to renew her successes of twelve or fifteen years since; Verdi to produce in French his last great opera "Aida." The famous cantatrice, while receiving a warm welcome from the Parisian public, is unfortunately but very poorly supported in the rest of the company, and it is not unlikely that the *impresario* may regret before long his engagement to pay the *diva* for her thirty nights, 10,000 francs for each performance.

From Alexandria.—A correspondent writes: In Alexandria it is *de rigueur* to drive on Friday afternoon along the canal and walk in the Khédive's garden, where a very good native band plays, and yesterday was Friday. Crowds of carriages were there, with spirited small horses, ploughing through such mud, liquid and solid, as one never sees in England, save at the churned-up entrance to a country field. They say every orad was like this a few years ago, but European enterprise has paved a great many, and no doubt the others will be done in time. I expect this was Italian "enterprise," for the pavement is of large squares of lava sent from Naples—to this land of granite!—laid diamond-wise. It makes capital roads, and lasts well, they say. It may answer in this dry climate, but at Naples we thought it horribly cruel for the horses; in wet weather it is so slippery, giving no foot-hold. We have been to see the obelisk *gotten* by America. It is now being built into a sort of barge, which is to be towed to the port where the American ship lies; both will be docked. A hole will then be opened in the ship's bows, and the obelisk slipped in. It appears as it now lies very clear and perfect. When raised from its base, Masonic emblems were found beneath, with inscriptions containing the date when quarried and by whom, and when removed to its present site.

PORTLAND CEMENT.*

I BELIEVE it is some forty years since Professor Donaldson made some very interesting and exhaustive experiments with Roman cement, and with the septaria from which that cement is made. Roman cement was then employed in almost every building of importance, while what is now known as Portland cement had scarcely emerged from the laboratory, and was practically unknown. The introduction of this then new cement, it is needless to say, was met on all sides with great opposition, but its eminently hydraulic properties and great strength eventually asserted themselves, until at the present time Portland cement is synonymous with strength. But, like all manufactures which assume large proportions, there are unfortunately both good and inferior cements to be met with; and as the strength of a concrete or mortar must depend not only on the quality and properties, size and shape, of its aggregates, and the means employed for their amalgamation, but also on the strength and quality of the cement, I propose in this paper to speak solely of the primary source of strength, viz., the cement.

The recognised tests for Portland cement are its weight per striked bushel; the fineness to which it is ground; its colour; and its tensile strength. With the exception of the tensile strength, which is an absolute test, these tests are really only problematical; for it is evidently possible to obtain a material that, in weight, colour, and fineness, may approximate to the standard required in cement, and yet not be cement. Hence a bad or a damaged cement may possess all these requisite qualities, and yet fail in the crucial test of strength. It is also possible, but in a minor degree, to have a cement that is of the required strength, but would yet fail to give the results expected of it, when made into concrete or mortar. From experiments extending over a considerable period, the results of which are given in the accompanying tables, I hope to be able by (1) determining the work which a cement has to do, and (2) by considering separately the properties which it should possess to attain that object, to arrive at such results as will be of value to both users and manufacturers.

Concrete or mortar, being a combination of aggregates which are united into a compact mass by means of the cement, it follows,—that the cement should possess strength; that it should be so finely ground as to thoroughly intermingle with and separate all the aggregates used, thus cementitiously uniting each particle; that it should set fairly quickly; and that it should neither expand nor contract during the setting.

Without describing the manufacture of cement, which is carried out in various ways according to the nature of the raw materials used, it may be considered, for the purposes of this paper, a combination of carbonate of lime, silica, and alumina, in certain proportions. These ingredients are obtained in different localities in various forms. Thus, on the Thames, the white chalk, which is nearly a pure carbonate of lime, is used in combination with Medway mud, which contains the silica and alumina. In many works on the Medway the grey chalk is substituted for the white, and Gault clay is used instead of the Medway mud. At Folkestone and other places on the south coast, similar materials are used. At Harwich, Newcastle-on-Tyne, and Stockton-on-Tees, a local blue clay which contains the requisite proportions of silica and alumina is used in combination with chalk, which is imported generally from the Thames. In the North of France,—in the neighbourhood of Neufchatel and Devres,—a natural cement earth is found, generally at the foot of the chalk hills. This material, which much resembles grey chalk in appearance, contains in many instances the exact proportions of lime, silica, and alumina, for the production of a high-class cement. At Rugby, in Somersetshire, and in other parts of England, the blue lias formation supplies the requisite ingredients, the stone and clay being found in layers of from a few inches to as many feet in thickness, one above another. At Madras a cement is made from lime produced from sea-shells, used in combination with a river mud, and I have lately been consulted respecting the manufacture of cement from somewhat similar materials, viz., coral lime and a river mud, found on the opposite side of India. At Rio de Janiero, also, similar raw materials are used. In Derbyshire the immense limestone hills may be made available for conversion into cement, in combination with a tufa which is also found in the locality. In Buckinghamshire, on an estate on which I am at present engaged, there has been found a deposit of a natural cement-earth, which lies immediately under the surface, and averages about 10 ft. in thickness, lying directly on the Oxford clay; with it is intermingled a considerable quantity of a nodular limestone.

It would be needless to enter more fully into the geology of Portland cement manufacture, but it may be taken that wherever carbonate of lime, silica, and alumina are met with, in a fairly easy convertible form, there Portland cement can be made. But with each variety of material, different means must be employed for attaining the desired end; and to describe the process of manufacture in each case would take up more time than is at our disposal. The process may, however, briefly be divided into three stages, viz.:—the thorough mechanical combination of the raw materials, their calcination, and the reduction of the clinker by grinding to the Portland cement of commerce. From this very cursory glance at the materials from which Portland cement can be made, and the mode of manufacture, it will readily be seen that there are many causes which may materially affect the result of the cement produced, viz.—the quality of the raw materials themselves, their amalgamation in correct proportions, their perfect mechanical combination, the proper calcination of the combination, the perfect reduction of the clinker to a fine powder, and lastly, the careful storage and cooling of the cement before it is used. To the causes of many of the results which may be met with, it is impossible to more than allude; but assuming that the raw materials have been well chosen, an imperfect amalgamation of them will probably produce a blowing cement. The use of an undue quantity of lime will produce the same result, combined with slow-setting powers, while the use of too much clay will produce a quick-setting cement, that will contract. Having secured the perfect amalgamation of the raw materials in the proper proportions, similar results may be obtained from imperfect calcination; thus a lightly-burned cement will be a quick-setting and an overburned cement slow-setting.

Having regard, therefore, to the number and combination of circumstances which present themselves for consideration when it is required to divine the causes which produce certain results, I propose to treat solely with the peculiarities and properties which developed themselves during the experiments made with certain samples of cement, and to deduce from these results certain data which may be of service in judging of the quality of a cement for the purposes for which it is required. The quality usually required of cement is in accordance with the standard set out by the Metropolitan Board of Works in the regulations relating to concrete building, viz., that,—

"The Portland cement shall be of the very best quality, ground extremely fine, and weighing not less than 112 lb. to the striked bushel, and capable of maintaining a breaking weight of 350 lb. per square inch, after being made in a mould and immersed in water during the interval of seven days."

It must be admitted that, taken as a specification for cement, this regulation is rather vague, and as in all matters appertaining to the testing of cement, great exactitude is required, and that a uniform and standard apparatus should if possible be adopted, I think that the Metropolitan Board of Works have it in their power, by somewhat enlarging on this regulation, to lead to the abolition of many abuses, and thus tend to the elucidation of many seeming contradictory results.

As the weight per striked bushel of a cement must evidently vary according to the means employed to fill the measure, it is essential that it should always be filled in the same manner. The apparatus which I use, and which I think meets all requirements, consists of a circular iron hopper or funnel, perfectly smooth on the inside, into which the cement to be weighed is placed; at the small end it has a canvas stocking which leads the cement into a zinc shoot, placed at an angle of 55°, the lower end of the shoot being 5 in. above the top of the measure. The measure, placed on a perfectly firm floor, on which there is no vibration, is never in any way touched during the process of filling, nor until after it has been carefully struck with a straight edge. When filling the measure, the stocking may be held in the hand so as to regulate the run of the cement from the funnel.

In a Paper I read before the Institution of Mechanical Engineers, in January, 1875, when referring to the weight of cement, I said:—

"A light cement is generally a weak one, though it may be of the requisite fineness; at the same time, a heavy cement, if coarsely ground, is also weak, and will have no carrying capacity for sand. As the more the clinker is burned the harder and heavier it becomes, and, therefore, more difficult to grind in the millstones, the heavy cements to be met with are almost invariably coarse ones; and as an under-burned cement from its softness will be ground fine enough, but will be found deficient in weight, so it will be seen that the weight, unless taken in conjunction with the fineness, is no test as to the quality of the cement."

This opinion I have found confirmed by subsequent experiments, the results of some of which are given in Table No. I. In each case the cement was weighed, tested as delivered, and also when ground; so that all would pass through a No. 50 sieve.* The tensile strengths given being in each case an average of ten briquettes.

Table No. I.

		Residue per cent. after sifting through sieve having 2,500 meshes per square inch.	Weight per striked bushel.	Tensile strength on section 1 inch square. 7 Days.	Tensile strength on section 1 inch square. 28 Days.
			lb.	lb.	lb.
No. 1	Cement as delivered from manufactory	25	114	535	661
	Do. ground to all pass sieve 2,500 meshes	Nil	104	572	not taken.
" 2	Cement as delivered	16	116	509	650
	Do. ground	Nil	109	542	675
" 3	Cement as delivered	14	116½	476	662
	Do. ground	Nil	112	505	710
" 4	Cement as delivered	33	118½	693	728
	Do. ground	Nil	105	666	810

By examining these results, we find, firstly, that by fine grinding, the weight per striked bushel is reduced; and, secondly, that the tensile strength is increased, both at the expiration of seven and twenty-eight days from the time of gauging. That the weight per bushel should be less is what would naturally be expected, as it is evident that the finer particles are less dense than the coarse, and also that they fall lighter into the measure. That the fineness to which a cement is ground should affect the tensile strength in so marked a degree, may be accounted for by the fact that the coarse particles in a cement have practically no cementitious property, being little better than so much sand. To prove this the following experiments were made with the core or coarse particles in a cement:—

1. The residue that would not pass through a 625-mesh sieve was gauged with water, and, at the expiration of seven days, was found to be merely held together in a mass similar to so much sand, having a slight admixture of loam.

2. That which passed through the 625-mesh sieve, but would not pass through the 2,500-mesh sieve, was gauged in a similar manner, and at the expiration of the same time was found to be in a similar condition.

3. That which passed through the 2,500-mesh sieve, but would not pass through a 4,900-mesh sieve, being gauged in the same manner, was at the expiration of the same time found to be in a similar condition.

These experiments were made with a cement that was perfectly set in thirty minutes after

* By Mr. Henry Faija, Assoc. M. Inst. C.E. Read before the Royal Institute of British Architects on Monday evening last.

* Fifty meshes to the lineal inch, or 2,500 meshes to the square inch.

gauging. In each of these cases the pats could be crumbled to pieces between the finger and thumb, and the granulations were the same in size and shape as before the water was put to them, thereby proving that the granulations themselves had no power of setting, but were simply held together by the infinitesimal particles of finely-ground cement from which it was impossible to separate them. It, therefore, seems that the granular portion, or the core of a cement, has really a deleterious effect on its strength, and for all practical purposes may be considered only as so much sand.

Table No. II.

	Sample No. 1.		Sample No. 2.		Sample No. 3.	
	7 Days.	28 Days.	7 Days.	28 Days.	7 Days.	28 Days.
	lb.	lb.	lb.	lb.	lb.	lb.
Cement as delivered from works.....	535	661	509	650	481	650
Ditto all ground to pass through No. 50 sieve	572	—	542	675	505	710
Siftings only passed through No. 50 sieve.....	547	697	573	668	452	629

Table No. II. gives the results of further experiments made with the same object. It will be seen that in samples Nos. 1 and 2 the cement was actually improved by extracting the core that would not pass the No. 50 sieve; but sample No. 3, which was a very finely-ground cement, slightly deteriorated; and it will be further noticed that all three samples were improved by fine grinding. Though in this paper I am not going into the strength of mortars, it would be well to say that the fine grinding would give a more decided advantage in the case of mortars than in neat cement.

Many people, even some manufacturers, consider the core to be the back-bone of the cement, and to a certain extent they are in the right, but the result of these experiments proves that to be of value it must be ground. It is naturally the hardest burned particles which form the core, those which the mill-stones have been unable to grind through their being of a harder nature than the rest of the clinker. The core, therefore,—as core is really only so much sand in the cement,—when ground acts in most instances beneficially, and improves the quality of the cement.

Table No. III.

No.	Specific Gravity.	Weight per Striked Bushel.	Residue per Cent.		Tensile Strength per square inch.		Increase per Cent.
			No. 25 Sieve.	No. 8 Sieve.	7 Days.	28 Days.	
		lb.			lb.	lb.	
1	3·09	116	2	16	509	650	27·7
2	3·00	116½	½	13	493	659	37·5
3	3·00	116½	0	14	471	594	26·1
4	2·99	118	4	28	605	772	27·6
5	2·96	116	4	24	586	767	30·9
6	2·95	113½	3	33	473	558	17·9
7	2·90	111	7	30	701	718	2·4
8	2·90	118½	8	33	693	728	5·0

Table No. III. gives the results of experiments made with eight samples of cement, showing the specific gravity, weight per bushel, fineness, tensile strength at seven and twenty-eight days, and the increase per cent. between those dates. If we examine the specific gravity and weight per bushel in conjunction with the fineness to which the cement is ground, it will be seen that a heavy weight per bushel and a heavy specific gravity denote a well-ground cement, while a heavy weight per bushel and a light specific gravity denote a badly-ground cement.

It has been proposed to substitute the specific gravity for the weight per bushel when testing cement, but it must be remembered that the object of testing cement is not only to determine the actual strength of the cement at a given date, but to be able to form a fairly accurate opinion as to its probable behaviour in practice. I therefore think that to do away with the weight-per-bushel test would be, to say the least, undesirable, as, when taken in conjunction with the fineness, a very fair opinion can be formed of the value of a cement,—an opinion which can be confirmed by afterwards taking the specific gravity; in fact, the specific gravity, weight-per-bushel, and fineness, bear a certain relative proportion to each other, indicating either a light or heavily-burnt cement.

By again referring to Table III. we find that the cements having a light specific gravity are quick-setting cements, which in seven days have already attained great strength, but which show but little improvement afterwards, while those having a heavy specific gravity are slower in setting, and at seven days do not show such good results, but continue to improve for a longer period. It is, unfortunately, impossible to lay down an absolute rule by which to determine the value of a cement. Almost every property, whether to its advantage or disadvantage, which it possesses, may be traced to more than one cause, and, therefore, might lead to opposite results in practice; and when it is remembered that an opinion, to be of any practical utility, must be given in a few days, and before the cement is required for use, it becomes entirely a matter of experience and thorough knowledge of the process of manufacture, to be able to give a reliable opinion as to the suitability of a cement to the work for which it is intended, by reference only to the problematical tests.

Having considered what I have called the problematical tests of cement, viz., its weight, fineness, and specific gravity, and shown the results which may be expected by this preliminary examination, there remain to consider the absolute test of tensile strength, and the manner in which it is carried out. The object of the test for tensile strength is to obtain the best possible results under certain conditions. The conditions are generally those already given in the extract from the regulations of the Metropolitan Board of Works.

It is evident that to obtain the best result, much must depend on the manipulation of the cement, the manner in which it is gauged, the amount of water which is used for the purpose, the care with which it is placed into and removed from the moulds, the length of time which is allowed to elapse after gauging before it is placed in the water, the form of the mould used, and many other minutiæ of manipulation which can only be acquired by actual experience and practice. The amount of water which is required to reduce a cement to a proper consistency, or technically to properly gauge it, varies from 16 per cent. to 20 per cent. A quick-setting cement generally requires a larger percentage of water than a slow-setting one, but the exact amount required can only be determined by actual experiments with the sample under examination. The amount of water required also depends upon the skill of the manipulator, as an experienced gauger will bring the mass to a proper consistency with less water than another of less experience or skill, and as the amount of water used materially affects the result obtained, the importance of using a minimum cannot be over-estimated. Many of the discrepancies which arise when testing cement are undoubtedly due to this cause. With the object of overcoming this difficulty I have devised a small machine for gauging cement, and I find that by its use less water is required, and that the operation of gauging is done much quicker, both points which materially affect to its advantage the result obtained.

The custom seems to have become general that the briquettes should be placed in water twenty-four hours after gauging; this time, though it is perhaps convenient to gauge up on one day and place the briquette in water on the next, gives a slow-setting cement every chance; still, it certainly does not act beneficially on a fairly quick-setting cement, and it is generally advisable to place the briquette in water as soon as it is possible to remove it from the mould without fear of damage; the twenty-four hours may be taken as the limit of time, as, though a cement which has not by then set sufficiently to bear removal from the moulds, may be a fairly good cement, it is too slow in setting to be of much practical value. Again with regard to the area of breaking section of the briquette, it is usual to specify that the cement shall carry so much on the square inch, and yet the briquette generally in use has a breaking section of 1·5 in. square, giving an area of 2·25 in. How this custom has arisen I am unable to say, but it would undoubtedly greatly assist in clearing up many of the discrepancies now to be met with, if one uniform section and form of briquette were adopted, and inasmuch as the strength on the square inch is specified, it would seem natural that the briquettes should have that area of breaking section. It will be readily understood that the form of the briquette has much to do with the results obtained, and it is essential that the strain put on the briquette should be tensile only, all crushing forces being detrimental and often resulting in the fracture occurring elsewhere than at the smallest part, and hence giving a false result. Also that the briquette should be capable of easy removal from the mould in which it is ganged,—avoiding all necessity of knocking the mould in order to remove it,—as such is liable to injure the set of the cement.

There is another matter which seems to have been overlooked, or, at all events, not estimated at its full value, by experimenters with cement, viz., the increase in strength between a briquette broken at the expiration of seven days, and at the expiration of twenty-eight days. Many cements will stand the ordinary test at seven days, and yet be utterly worthless at twenty-eight days; others will give a good result at seven days and improve but little afterwards, while a cement that gives a comparatively low result at the expiration of seven days may at the expiration of twenty-eight have considerably increased in value. The result of the subjoined experiments shows that this is a most important matter in estimating the ultimate strength of a cement.

Table No. IV.

No.	Tensile Strength, Section 1″ Square.			Increase or Decrease per cent. at 28 Days.	Increase or Decrease per cent. at 3 Months.
	7 Days.	28 Days.	3 Months.		
	lb.	lb.	lb.		
1	380	210	...	−44·73	
2	701	718	728	+ 2·42	+ 3·85
3	519	647	716	+23·86	+40·39
4	6·5	772	826	+27·60	+36·52
5	476	662	...	+39·07	
6	693	728	...	+ 5·05	
7	582	764	901	+29·88	+52·97
8	666	8.0	...	+21·62	

By an examination of Table IV. it will be seen that No. 1 was a cement that actually satisfied all requirements at the expiration of seven days, and yet at twenty-eight days was actually worthless, being much blown, and consequently having no strength whatever; and it would undoubtedly have pulled to pieces any work in which it was used. Nos. 2 and 6 were both strong quick-setting cements, and showed good results at the expiration of seven days; in fact, they seem in that short time to have attained almost their ultimate strength, as their increase during the next three weeks was but two and five per cent. The other samples show results varying from 20 to 40 per cent. increase in tensile strength between the seven and twenty-eight days, and it will be seen that at longer dates the quick-setting cements are by no means the strongest. The importance of fine grinding is again exemplified by examples Nos. 6 and 8. No. 6 is the cement as received from the works —33 per cent. of it would not pass through the No. 50 sieve. No. 8 is the same cement, but ground so fine that it would all pass the same meshed sieve; while in the cement as delivered, the increase in strength between the seven and twenty-eight days was but five per cent., when ground the increase amounted to 21 per cent.

In this paper I have treated solely of what may be considered good cements, and have given the result of the tests made with them under different conditions. The failure of a cement by expansion or contraction during the process of setting has not been brought under consideration, but it is needless to say that a cement which does either would be a dangerous cement to use, the only exception being that a good cement will sometimes blow if used too soon after it has left the mill and before it has had time to cool; such a cement would, after being properly warehoused, be perfectly reliable.

The deductions which I draw, and which I have endeavoured to prove from the experiments, are:—

1. That the weight per striked bushel, unless taken in conjunction with the fineness to which the cement is ground, is absolutely valueless as a guide to the quality of a cement, and that therefore the two should always be taken in combination, and that it is also advisable when possible to take the specific gravity.

2. That the finer a cement is ground, the less it will weigh per striked bushel, but that it will at the same time be stronger.

3. That the core or coarse particles in a cement act deleteriously, and can be compared only to so much sand.

4. That to be able to form a true opinion of the value of cement, briquettes should, when practicable, be tested at twenty-eight days as well as at seven, and that the greater the increase per cent. is between those dates the stronger and harder is the cement likely to become.

The details of the weight and fineness, and other matters deduced from the foregoing tests, I have embodied somewhat in the form of a specification, which I think meets most requirements, but the purposes for which a cement is to be used must of necessity govern many clauses. Thus:—

Specification.

Sample.—From each delivery of cement on to the works, a sample of about one bushel will be taken indiscriminately from at least twelve sacks or casks, as the case may be, and will be subjected to the following tests, with the whole of which it will have to comply. The sample thus taken will be considered to indicate the quality of the entire delivery.

Fineness.—The cement to be so finely ground that it will all pass without leaving any residue when sifted through a copper wire sieve having 625 holes to the square inch, and when sifted through a similar sieve having 2,500 holes to the square inch, the residue, or that which is unable to pass through, shall not be more than 15 per cent. of the bulk before sifting.

Weight.—The weight per striked bushel to be not more than 116 pounds nor less than 108 pounds, but the weight must in all cases depend upon the fineness:—thus, according to requirements, a cement which, when sifted through a sieve having 2,500 holes to the square inch, leaves a residue of from 12 to 15 per cent., must weigh not less than 112 pounds per striked bushel; should the residue be from 8 to 12 per cent., the minimum weight to be 110 pounds; and should there be less than 8 per cent. residue, the minimum weight to be 108 pounds per striked bushel. The bushel measure to be placed on a level floor where there is no vibration, and in every case filled from a zinc or other smooth-surfaced shoot, placed at an angle of 55 degrees, the lower end of the shoot to be 5 in. above the top edge of the measure. The cement to be allowed to run continuously along the shoot until the cement in the measure is well piled up, when it is to be struck level with a straight-edge. In no case is the measure to be in any way touched or shaken, until it has been struck.

Specific Gravity.—The specific gravity to be not less than 2·95 nor more than 3·1.

Tensile Strength.—Twenty briquettes to be gauged from each sample, ten to be broken at the expiration of seven days from the date of gauging, and ten at the expiration of twenty-eight days from the date of gauging. Those broken at seven days to carry an average weight of 400 pounds per square inch of section without fracture, and those broken at twenty-eight days to show an increase in strength of 25 per cent. over those broken at seven days.

The following particulars are to be observed in gauging the cement to form the briquettes:—The contractor to use any form or section of mould he chooses in which to make the briquettes, provided always that the breaking sectional area of the briquettes be not less than one square inch. The moulds in which the briquettes are made to be placed on glass or other non-porous beds. The amount of water used for gauging the cement not to be more than 19 per cent. of the whole. The briquettes to be removed from the moulds and placed in water within twelve hours from the time of gauging, and allowed to remain therein until they are due for breaking (which will in every case be reckoned from the time of gauging, and not of placing in water), and to be broken immediately on being taken out of the water.

Expansion or Contraction.—Pats about 3 in. or 4 in. square, and about ½-in. in thickness (gauged with the same per centage of water as is used in forming the briquettes), placed on pieces of glass, to be immersed in water within four hours from gauging, and to show neither cracks on the edges nor on the surface, nor deviation in form when examined at the expiration of seven days.

NEW FINE ART INSTITUTE FOR GLASGOW.

THE opening of a Fine Art Institute in Glasgow on the 3rd inst. was an event of considerable interest in the West of Scotland. Edinburgh is, and has always been, the seat of art North of the Tweed; but lately the western metropolis has been making praiseworthy progress in painting. The selection two years ago of Mr. (now Sir) Daniel Macnee to the post of president of the Royal Scottish Society of Arts, necessitating his removal from Glasgow to Edinburgh, showed that the Western masters were not unworthy of the highest honours. The Fine Art Association is of recent origin in Glasgow, dating no farther back than 1861; and its success has been owing to the public spirit and great energies of some prominent citizens. Until this year the Glasgow Town Council had set apart rooms in the Corporation galleries for the Association's exhibition. Now, it appears, the rooms in question are required by the Corporation, and in consequence of a hint that the Association would have to find accommodation elsewhere, the idea of building a regular institute was mooted. The suggestion very soon took practical shape, and from plans prepared by Mr. John Burnet, St. Vincent-street, building operations were commenced on a site in Sauchiehall-street, not more than 200 yards from the Corporation galleries. A better spot, both in respect of thoroughfare and convenience for the citizens and West of Scotland public in general, could not have been chosen. The work was begun on the 4th of October, 1878, the arrangement being for completion for the Spring Exhibition of this year; but owing to some litigation delay took place, and the result is that, though formally opened and used for the Exhibition the front elevation is far from being completed.

But for the fact that the street floor is reserved for shops, the building is a public one in the real sense of the term. There is no distinct style of architecture, the severe and refined Greek being blended with the full flowing lines of the Renaissance, in order to get a full share of breadth and dignity. There are no windows in the frontage above the street floor, and an entresol is introduced between the shops and the blank wall,—the entresol and shops forming the base on which the galleries are constructed. The elevation is divided into a central and two side *motifs*. The central *motif*, rising from the street level, contains in the base the entrance-door, built within the archway, measuring 12 ft. 6 in. by 18 ft. high, on the keystone of which is carved a head, representing Fine Art, from which rise on each side branches of oak and laurel. Medallions of Raffaelle and Michelangelo, carved by Mr. Young, Glasgow, are on either side of the entrance; and the upper part of the central portion embraces the Sculpture-room, the necessary side-light of which forms the feature of the elevation. This is supported on either side by double Ionic columns, surmounted by enriched attics and pediments, crowned with a group of statuary, representing Minerva, and figures illustrative of painting, sculpture, and architecture. The artistic work in this part is by Mr. John Mossman, who is also engaged to carve alto-relievos representing the different schools of art, the masters of which are forming in procession on both sides of the building and meeting in the centre. The vestibule at the main entrance, the floor of which is laid in red and white and black marbles, measures 23 ft. by 24 ft., is 21 ft. high, and leads by a short flight of steps to the staircase. The opening into the staircase is divided into three, the middle division being supported by piers. The staircase measures 24 ft. by 24 ft., and 30 ft. high; the paving design is similar to that of the vestibule, the whole being draped with yellow curtains, and lighted from the roof by a cupola. There is no richness of detail in the ornamentation, and the effect depends more on arrangement and play of light and shade. The doors to all the prominent rooms are filled with plate glass, on which are engraved palm-leaves and texts.

The sculpture-room, in the centre, is 32 ft. by 24 ft., and 25 ft. high. The pediment of the door is enriched with a palm-leaf and a shield, bearing the monogram of the Institute. The walls are lined with timber and painted red 12 ft. from the floor, the background of which is to be decorated with drapery. Five apartments, two of which are on each side of the sculpture-room, constitute the picture-galleries. They are entirely of woodwork, and have been designed for decoration, which, when carried out, will be Etruscan in style. The walls are painted a red colour, 14 ft. above the base, which is 2 ft. high. Simplicity of arrangement is the one feature of the internal appearance.

The contractors were,—mason's work, Mr. John Maxwell; joiners' work, Messrs. Keiller & Black; plasterers' work, Messrs. Thos. Millar & Co.; slaters' work, Messrs. A. & D. Mackay; plumbers' work, Messrs. Brown & Young; and stair-railings, Mr. Philips.

Technical Education.—The Cutlers' Company have under consideration a scheme by which the benefits conferred on the cutlery trade by their late competition and exhibition of cutlery will be still further extended, and a continuous supply of skilled workmen provided for the trade,—namely, the grant of a sum of money annually to be applied in the apprenticing of respectable youths to members of the cutlery trade, thus assisting also to revive the old apprenticeship system, which answered so remarkably well in the earlier days of the ancient guilds, but which has during the present generation almost entirely disappeared.

A PRUSSIAN M.P. ON THE STATE OF ARCHITECTURE IN GERMANY AND IN ENGLAND.

THE well-known lawyer and Catholic member of the Prussian Chamber of Duputies, Dr. Reichensperger, has for many years waged war with the system of education prevailing in Germany in reference to architecture and building, and has for a generation past vehemently opposed the extension of the official element in connexion with these arts. He greatly prefers the English system, under which architects, builders, &c., learn their business as pupils of the acknowledged masters of the profession, to the German system of training for these professions in certain special schools or technical colleges like the *Bau-Akademie* and other *Bau-Schulen* in Berlin and elsewhere. Some remarks recently made in the Prussian Parliament on these matters have attracted a great deal of attention, both among the general public and in the professional circles more immediately interested; and as it may not be without interest for Englishmen connected with these professions to hear what is being said of them abroad, we translate for the benefit of our readers the most important of Dr. Reichensperger's statements, together with the remarks of some German critics thereupon.

After renewing his complaint of the evils attendant on the existence of so large a number of official architects, builders, and "counsellors" of architecture, &c., the red-tape circumlocution and perpetual interference of this "legion of Government architectural officials" with ordinary builders and architects, Dr. Reichensperger said the time had come when a radical reform was urgently demanded. He pointed to the Middle Ages, which had given us such splendid monuments of architecture and the builder's art, without the help or interference of "this vast army of building inspectors, architectural counsellors, consulting architects, and all the building and architectural mandarin-bureaucracy" such as Germany has saddled herself with in the present day. Continuing his speech before the Prussian Deputies, he said, "I beg you, gentlemen, just to cast a glance across the Channel at England. I have studied the state of things there pretty thoroughly, and I may venture to assure you that even at the present time there is only in a very minute degree anything in England similar to all this apparatus of officials such as we have. In England they have just simply done what I should recommend our doing here. In accordance with their fortunately greater adherence to tradition than is found with us on the Continent, people in England have simply gone on building on the system and on the experiences of the Middle Ages. In a word, in England there prevails the system of the masters' schools. Gentlemen will hardly understand it when I tell them that there is no compulsory Government examination for architects; while here with us (German) there is an excess of such unproductive examination business, which, I may say, leads to the very opposite of that which was expected. In England there is no Government *Bau-Akademie* (Technical School of Architecture and Building); in a word the great official apparatus, such as we have here, does not exist; and, nevertheless, those who know England will, no doubt, agree with me that in every department of the field of architecture we are beaten by the English. I think, therefore, gentlemen, it would be worth while for the State to have the matter thoroughly investigated as to how the thing was managed in the Middle Ages, and how they manage in England at the present day. I hope that we should arrive at the result that it would not be a very great misfortune, if we shut up our *Bau-Akademie*, and throw the keys into the Spree. I would, in order to avoid prolixity, only ask you just to look, for example, at our railway-station buildings in Prussia. With very few exceptions, they bear the stamp of tediousness upon them. If there is any attempt there at luxury, it will be found generally to be a luxury without character, and purposeless. But it is worse when those gentlemen, the inspecting architects, undertake to execute anything in the 'Gothic' style; the architect-inspector's 'Gothic' has, so to speak, become a by-word."

By uttering these remarks, and others of a similar character, from his place in the Prussian Chamber, Dr. Reichensperger has naturally roused the ire of the professions attacked, and

more especially the Government officials belonging to the professions. Various organs have replied in terms of more or less bitterness to Dr. Reichensperger's attacks, and they appear not always to have preserved their temper in the controversy. The way in which the *Wochenblatt für Architekten und Ingenieure* reproduced the Deputy's words was declared by the speaker to be a complete distortion of his words and statements. The *Cologne Gazette* has two or three of its huge columns of comment on the words of Dr. Reichensperger, which amount to little more than calling him a *dilettante* critic and dabbler in what he does not understand. There are, likewise, ponderous attempts at joking, which we spare our readers.

NOTES ON EARTHWORKS.

THESE notes were taken at various times in late years, usually on the spot to which they relate, but sometimes from books and other authorities. They relate generally to moated mounds, that is to say, to earthworks such as those which are, in the Saxon Chronicle, attributed to Eadward the Elder, and Æthelflæd the lady of the Mercians, at the beginning of the tenth century. It is to be hoped that these earthworks, which are still found all over England, and occasionally in Scotland and in Wales, will receive the attention of the Ordnance surveyors, now engaged upon the large-scale maps. In those to the inch scale they are occasionally omitted, nor is there any special system of nomenclature employed by which these works, which are both remarkable and peculiar, can be distinguished.

A few of the notes relate to other earthworks of a different type, and probably of earlier date and wholly different origin. G. T. C.

PENRICE.—This is a remarkably well-defined and good example of a moated mound, with an appended platform protected by a marginal bank.

Penrice is a parish and manor in Gower, no doubt of Welsh name and origin, and in that respect differing from a large proportion of the surrounding parishes, as Cheriton, Ilston, Bishopston, Oxwich, Oystermouth, Nicholaston, and Weobly, the names of which are older than the Norman conquest of Gower, and belong, therefore, either to an earlier incursion of English from beyond the Severn, or to a settlement of Scandinavian pirates and vikings upon the coasts, such as may certainly be supposed to have given name to the shoal of Helliwick, and to the adjacent town of Swansea.

Near the centre of the parish, about a mile from the sea, at Oxwich Bay, is a steep and rather lofty knoll, known as Capon's Hill, the well-defined summit of which forms a crest of about 350 yards from east to west, and 50 yards broad, and is probably the "Pen" or "Head" which enters into the name of the parish; near its centre stands the ancient parish church, the earthwork being about 100 yards to its west, while to its east is another rather marked summit, which, however, does not appear to have been fortified, the banks upon it being evidently connected with a disused quarry. The churchyard is defended to the south by a bank, against which is built an ancient wall; this, however, is said to have been connected with the accommodations for a celebrated fair, the licence indulged in at which gave to Penrice a somewhat unenviable notoriety in the district, and which is now either translated or abolished.

The earthwork crowns the western end of the knoll, and thus is defended by very steep ground towards the north, west, and south sides. On the east its defences were artificial and less formidable. They are now partially built over, and occupied by a road and garden, and in great part obliterated. The work commands an extensive view, and its aspect from the valley on its west is formidable.

It is composed of a low mound of oblong, or rather oval figure, having its edge or crest raised into a bank, from which descends a steep slope, the foot of which is the centre of the circumscribing ditch. The farther side or counterscarp of this ditch seems also to have had a bank, beyond which succeeded the natural slope of the ground. The entrance was slightly oblique, and is on the protected side, or that towards the church. The dimensions of the mound from crest to crest are 120 ft. north and south, by 84 ft. east and west, with an area within the bank of about 90 ft. by 54 ft. The crest towards the north is about 10 ft. high inside, and 20 ft. above the ditch, and sharp and narrow. On the east and west fronts it is much lower, and to the south not above 3 ft. high. As, however, the outer ground descends rapidly, the exterior slope is at least 14 ft. The ditch is best preserved on the north front, where it is 10 ft. deep and 20 ft. broad. Towards the south it is less marked, and to the east partly filled up.

The mediæval castle of the knightly family who derived their name from the place was not built upon the older earthwork, but in a more convenient, but still strong, position about 1,100 yards to the east, where remain the ruins of a building already described in the pages of the "Archæologia Cambrensis."

The church, at no great distance from the earthwork, presents nothing very remarkable. The entrance to its south porch has a bold bead and fillet in a good Decorated style, and the inner doorway of the church has an acute arch of the same date. The door-frame is of oak, and old. There are also some monuments on the walls as yet unrecorded. These are:—

William Bennet, of Sanctuary, gent., d. June 24, 1698.
Priscilla, his wife, dau. of Rowland Dawkins, of Kilbrough, esq., d. April 3, 1685.
Rowland Bennet, gent., their son, d. January 17, 1714, æt. 32.
Sarah, his widow, dau. of Mansell Matthews, gent., d. April 23, 1735, æt. 67.
Arms A.: Three goatsheads erased sable, corned *or*, impaling, *or*, three chevrons *gules*.
David Bennet, of Pit, gent., bd. April 8, 1668, æt. 81. He married Anne Lucas, and had six children.
On the floor:—Elizabeth Mansell, d. September, 1686.
John Hanson, only son of Thomas and Francis H., b. April 13, 1741; d. June 5, ——.

NEWCASTLE, near Rockfield, in Monmouthshire, where the road turns off to Skenfrith, takes its name from a fine example of a moated mound. This mound is conical, about 30 ft. high and 40 ft. diameter on its top. It has the usual concentric ditch, now in part filled up, but with a very visible outline; and on one side, beyond the ditch, is appended a kidney-shaped platform covering about half the circumference, and having a ditch of its own which communicates at one end, and did no doubt at the other, with the main ditch. The platform is not embanked, but rises somewhat towards its outer edge. It has a steep scarp, and beyond the ditch the ground falls steeply. The inner ditch is about 20 ft. broad by 8 ft. deep. The platform is about 42 ft. broad, and its scarp about 20 ft. deep, with a ditch 30 ft. wide at its base. The platform is on the north side of the mound.

This work stands not far from the meeting of three roads. Very near, on its south-west side, is a farm-house, and on that side the mound has been a little cut into, an encroachment which has been checked by the roots of a very fine old yew tree. Parts of the ditch still contain water. Much of the mound is artificial. There is no trace of masonry. This work is mentioned by Coxe, but is not laid down in the Ordnance map.

LLECHRYDD, in the county of Radnor, two miles or so north of Builth, upon the left bank of and half a mile from the Wye, close to Cwrt Llechrydd, is an earthwork, marked "Castell" in the Ordnance map. It is composed of a mound, slightly oval, set within an enclosure formed by a bank and ditch, not quite rectangular, but with four straight sides.

The mound is about 30 ft. high, having a top which, though rugged and irregular, probably was originally flat. It is about 404 ft. in diameter, north and south, at its base, by 497 ft. east and west, and its top is about 60 ft. less each way. It is wholly artificial. This mound stands within the enclosure about 48 ft. from the west, and 14 ft. from the east side. On the north and south sides these distances are 35 ft. and 25 ft. The area round the mound is flat.

The bank which encloses this area is about 5 ft. high and 15 ft. broad. Its lengths are, on the north side, 448 ft.; on the south, 549 ft.; on the east, 528 ft.; and on the west, 646 ft. Beyond the bank is a ditch, about 30 ft. broad, and at present 6 ft. to 8 ft. deep. It was supplied with water from an adjacent rill. The whole area covers about 10 acres. The railway from Builth traverses and cuts off the south-western angle of the work.

Llechrhydd, and probably, therefore, this earthwork, is generally supposed to be the place at which was decided the contest between Rhys ap Twdwr and the sons of Bleddyn ap Cynfin, Prince of North Wales, in 1087. These sons had harried much of Radnor, and here awaited the attack of Rhys, who was accompanied by Madoc, his son-in-law. Rhys attacked and took the stronghold; Biryd and Madoc, sons of Bleddyn, were slain, and Cadwgan, the elder son, fled, wounded, to a rocky refuge, in the district, still known as Cilleg Cadwgan, whence he finally escaped. It is also said that Lewellyn, the last Prince of Wales, rested here just before he met his death near Builth in 1281.

There are remains of masonry on and about the mound, but it does not appear to have been ascertained whether they are part of an early castle or of a later manor-house.

There are very many moated mounds in North Wales, though scarcely so many as in the South, and along the Middle Marches. Among them may be mentioned:—In Flintshire, the mound at MOLD, the site of a Mediæval castle. This mound was called in Norman records "Mons Altus," whence the ancient family name and title of Montalt. At LEESWOOD, near Mold, is a large mound, planted with trees, and supposed to be ancient. There was, however, early in the last century, a certain Sir Geo. Wynne, who spent very considerable sums in altering the surface of his garden, and it has been suggested that this mound was his work. There is also a large mound close to the castle at RHYDDLAN. In Caernarvon, at Dolbenmaen, near Tremadoc, is a hillock marked TOMEN in the Ordnance map, which is described as a moated mound. It is on the banks of the Dwyfni river, and very near the parish church.

There is also a mound at CHIRK, in Denbigh, on the banks of the Ceiriog, which is thought to be of the same character. Also at PONT SYCHARTH, on the Cynllaith, four miles west of Offa's dyke, is a mound, shown but not named in the Ordnance map, and reported to have been a residence of Glendwr. This mound is said to be a natural knoll artificially scarped. Mr. Webb, who examined it, found no remains of masonry, but several large nails, as though the structure had been of timber. Merioneth contains many of these mounds, several of which have been visited by Mr. W. W. E. Wynne, Mr. Ffoulkes, and Mr. Webb. Among them are the Tomen at EDREINOG, and another resembling it at TAVOLWERN, half a mile from the Wynnstay Arms at Llanbrynmair. This is a reputed residence of the Princes of Powis, one of whom, or of North Wales, dates a charter from hence, preserved at Wynnstay, about the end of the twelfth century. There is no trace of any fortified base-court or work outside the ditch. The circular camp at Brogyntyn, described in the "Archæologia Cambrensis," is said to have been the residence of Owen Brogyntyn early in the thirteenth century.

The largest mound in North Wales is thought by Mr. Webb to be TOMEN-Y-BALA, between the town and the Tryweryn brook. It is noticed by Pennant in his "Tour in Wales," edition 1784. The local creed holds that the soil of this mound was brought from Italy. Near this, upon the outlet of the Dee from the lake, is another mound, marked in the Ordnance map as CASTELL GRONO, but called also CASTELL-BEFYR-BENLLYN. A third mound, of a military character, about two miles to the east, is TOMEN-Y-CASTELL. There is also a mound at RÛG, though most probably of a sepulchral character. It gives name (Crûg) to the place.

Between Corwen and Llangollen, on the right bank of the Dee, is OWEN GLENDWR'S MOUNT, and near it the moat by which his Mediæval residence was surrounded. A short mile from this, on the same bank of the river, is another tumulus called YR HEN DOM (Hên Domen), or the Old Tump, also probably the site of a fortified house. Also at Talgarth, near Pennal, three miles west of Machynlleth, is TOMEN LAS, on the bank of a small stream, and very near the parish church. TOMEN LAS is also the name of a similar large mound upon the left bank of the Dyfi, at its mouth. This is a district full of interest. Machynlleth is upon a Roman road, and near it, at Cefn Caer, was a Roman station. Near it, also, was fought the bloody battle between the partisans of the Roses, where Thomas ap Griffith ap Nicholas, father of Sir Rhys ap Thomas, met his death.

SUTTON WALLS.

The entrenchment well known by this name in the county of Hereford, has given rise to many speculations, and been attributed to different authors at very different dates. The detached hill, the summit of which is occupied by it, and the irregularities of which have

governed its figure, rises to a moderate height about 4½ miles to the north of Hereford, in a fertile and well-timbered district, of which the principal features are the rounded eminences which characterise the old red sandstone. The hill rises by gradual slopes, steeper towards the summit. Half a mile or so to the west is the stream of the Lug, on its way to the Wye at Modiford. The district, though containing many hills favourable for such entrenchments, presents but few, the only three within a radius of six miles being Risbury, on the north; Credenhill, to the south-west; and the small cairn of Backbury, to the south-south-east. At a rather greater distance is Dindor, to the south.

Three miles to the south of Sutton a road, evidently of Roman origin, runs east and west, and upon it was the station of Magna Castra, represented, probably, by Kenchester, and this road, a mile west of Hereford, is crossed by a road bearing the name of Watling-street, and running north-north-west for Stretford and Wigmore. Though a part of the Welsh March the district abounds in English names, those of Pen-Combe, Dinmore, and Coedmore, evidently British, being few and far between. Near as the district is to Wales, its proper names, even of the rivers and hills, are mostly English. Offa's Dyke lies eight miles west of the Camp, and scattered about are many moated mounds, such as Kilpeck, Ewias, Hereford, Sunny Bank, Howton, the Vineyard, Eign, and others undistinguished by a name, and which show for how long a period the country was held by its Mercian, that is, its English invaders.

Sutton-walls is a work of the usual hill-camp type, its outline being governed by the natural contour of the hill. It is about half a mile from east to west, and 250 yards broad at the east and 200 yards at the west end, and includes about 30 acres. It is in general form a rounded oblong, though very irregular. There is a curious projection to the south-east to suit a spur of the hill, and on the south front, near the west end, a considerable shoulder projects at a right angle flanking the approach. If there was a bank along the edge of the platform it was a low one, and has been worn away by cultivation. The natural slope has been cut and scarped so as to produce a steep of 20 ft. to 30 ft. high. Here and there are traces of a slight ditch at the foot of the slope, but the place of the ditch is mostly occupied by a sort of shelf or platform, which probably was fortified, especially on the north-western quarter. The west or narrower end contains three entrances,—north, south, and west. These are deep, hollow ways, running up a few yards into the camp, like the smaller entrance at Old Sarum. Connected with the northern entrance is a deep pit, possibly for a wigwam, but which may be a marl-pit. It is known as Offa's Cellar.

The western is the main entrance. The approach came up from the south, and skirted the Camp for a few yards at the foot of the slope, until it turned to reach the entrance. This is a deep hollow way, or cut, flanked by two bastions in earth, which protect the road for a few yards until it turns to the east. There may have been a fourth entrance at the south-east corner, covered by the spur. Besides these are one or two notches in the slope, possibly natural.

Sutton was a residence of the kings of Mercia at least as early as the reign of Offa, who is said there to have murdered Æthelbert, king of the East Angles, about 792, a crime by the atonement for which the adjacent cathedral largely benefited. It is called by Giraldus King's Sutton. Leland refers to "the rnins of some ancient and great building" at Sutton, thought to be the remains of King Offa's mansion. There is no trace of masonry within the camp, which, though of British construction, may, of course, have been occupied by Offa, who, however, is far more likely to have lived on the low ground near the church.

Sunny Bank, rather above a mile north-east of St. Devereux Church, in the county of Hereford, is a farm-house, marked Sunny Bank on the Ordnance map, and which stands at the head of a small brooklet tributary to the River Worm. In the court just below the house, and partially within its yard, is a very distinct moated mound, placed on the right bank of the stream, about a dozen yards from it, and 20 ft. to 30 ft. above it. The mound is table-topped, about 25 ft. diameter. It is not above 6 ft. to 10 ft. high, and its slope on the eastward side descends to the brook. The ditch on that side is scarcely to be traced, and, indeed, all round has been much obscured by cultivation. The base-court was outside the ditch to the north-west; it is of considerable area, and extends into the farm-yard. It was contained within a bank and a ditch. Of the former, traces remain, but the latter is nearly effaced. Though never very large, and now considerably weather-worn and reduced by tillage, this is certainly a moated mound, and one of the same class with that at the vineyard a mile below Hereford, on the left bank of the Wye.

Howton.—In a field close north of the railway between the St. Devereux and Pontrilas stations, is a very well defined and regular circular mound or raised platform, about 60 ft. diameter, and about 8 ft. high above the bottom of its circumscribing ditch, which is about 3 ft. deep. The top is level. There is no base-court; no outworks of any kind. It is not noticed in the Ordnance map, neither is the earthwork at Sunny Bank; and the omission is remarkable.

At Longtown, in the same county, is a motte and circular keep. [*Archæol. Journal*, v., 42.]

Sibbertoft.—At this place, in Northamptonshire, is said to be a moated mound with a base-court attached, and the Ordnance map places it between the two heads of a brook which flows northwards down a steep, narrow, wet, and thickly-wooded ruin, which opens upon the plain of Marston-Trassell. Unfortunately, not only is the ground below very swampy and treacherous, but the wood is composed of ash-poles set pretty close, and which, in August, 1878, were growing out of a strong crop of nettles about 6 ft. high. An attempt then made to discover and examine the work utterly failed, and it is much to be desired that the very eminent botanist who resides hard by would give some account of what is probably a very remarkable earthwork.

Bridges calls the promontory Fox-hill, and says it was the site of a castle and called by Morton the Castle-yard. He mentions a mount and a ditch enclosing about half an acre, and speaks of the remains of a stone wall. Nothing is on record as to a castle here,—that is, as to a work in masonry. If such there were it was probably one of the "Castra adulterina," or unlicensed castles, hastily constructed during the turbulent reign of Stephen, and levelled on the accession of Henry II. The account in Bridges is taken from that, much earlier, of Morton.

Moot-Hill, in Sibbertoft.—Bridges states that at the battle of Naseby Charles's standard was raised upon Moot-hill, half a mile eastward of Sibbertoft town. This must be a rather remarkable tumulus shown in the Ordnance map, and resembling a sepulchral barrow. Naseby field is about two miles to the south.

Moot Hill, in East Farndon, Northamptonshire. Here the crown of the hill, a very commanding position, is fortified by a considerable bank and ditch, following the outline of the ground, and indicating a large area. This is no doubt British. To its south, and close by the parish church, is a work, which probably is in part connected with the camp. The churchyard seems to have been enclosed within a ditch, which is still deep and broad along its south front, while to the south-west, and outside of this ditch, is a mound, which is evidently the Moot-hill mentioned by Bridges. It appears that the camp is known as the Hall-close, and the ditch near the church as Gallock-close. Morton, who has paid great attention to the earthworks of the county, and whose conclusions are far in advance of his age, states that in the country about the head of the Welland, are many moot-hills, about which the people held folkmotes in times of public danger. The earthworks here and at Sibbertoft seem intended to afford protection from enemies from the north and north-west.

Mill Moat.—West of the detached church of Oxendon Magna, near Market Harborough, is a place marked in the Ordnance map as Mill Moat. It is a small moated mound of no great height, and without any base-court attached to it. It seems to be of late date, and was probably the base of a windmill.

Puddington.—In this parish, in Bedfordshire, but on the borders of Northampton, is a fine specimen of a moated mound, about 160 yards in girth at the base, and about 8 yards diameter at the top, and about 13 ft. high. The moat seems to have been full of water 200 years ago, when, in a parish map, it is called the "Plain Pond." It is now called the "Great Plain."

Chalbury, about three miles and a half north of Weymouth, is a southern outline of the Moignes Down ridge, the summit of which is crowned by an earthwork of irregular form, following the configuration of the hill, and, therefore, approaching to a circle. It is of large area, and its defences are formed by scarping the chalky soil to a steep slope, on the crest of which is a bank and at its base a ditch, which, where the ground is naturally less steep, is repeated as a second, outer, and lower ditch. The defences vary in strength according to the character of the ground, and where it is very steep even the cresting bank is omitted. The ascent to the camp is on the southern side, and passes obliquely across the two ditches and up the intermediate slope. The enclosed area has a broken and rocky surface, and rises considerably towards the centre, upon which are the remains of two barrows, of which one is seen to contain traces of a stone cyst. Scattered over the area are a number of shallow circular pits, 12 ft. to 15 ft. in diameter, evidently the sites of wigwams, and besides there are two of larger size, 30 ft. diameter, and deeper than the others, and which may have been water-tanks.

The diameter of the camp within the bank varies from 200 to 250 yards. Upon the Ordnance map of 1811, it is shown as a regular circle or something very like one. It will be seen upon inspection that this is not so. Though its general figure is nearer to a circle than to any other regular figure, it is evident that it was not regularly set out as a circle, but was governed by the outline of the ground. There does not seem any reason for regarding it as constructed upon any principle of castrametation different from the hill-camps of Maiden Castle or Abbotsbury, or any of the admitted British camps of the district. Near to this camp is the fine group of large sepulchral mounds which distinguish Moignes Down.

The natural approach to a circular outline is seen in many of these hill-camps where they happen to occupy the summit of a conical hill, and the distinction between such an outline and an artificial and regular circle is important, because it is not unlikely that upon this may be found to rest the evidence of the different age and origin of the two types.

BADBURY RINGS, CO. DORSET.

This is a magnificent camp, in a fine position, covering a large area, and composed of earthworks of unusual bulk. It occupies the summit of a hill, which, though high above the sea, rises gently from the ground about it. The slopes are easy, not too steep for a carriage-drive, and the turnpike road from Wimborne to Blandford passes near to its outer defences. The hill is, however, sufficiently steep and well defined to account for the circular figure of the camp, which is evidently governed by the ground, and not set out by any rigid rules of castrametation. For this reason, it is probable that the work is either Belgic or British, not English.

The elevated down, of which Badbury marks the summit, is a broad extent of high ground, which lies between the Wimborne brook and the Tarrant or Trent, and to the south has the low and broad valley of the Stour. This part of the country is studded thickly with sepulchral barrows, and due west of the camp runs the Ackling Ditch, a Roman road from Old Sarum, which, if produced beyond Badbury, would nearly strike Wareham. No doubt this country was inhabited and contested by both the earlier and later Britons; but the only hill forts within a reasonable distance of Badbury are,—Bosbury, a large camp beyond the Tarrant, three miles to the north-west, and Crawford Castle, a rather smaller work, about the same distance to the west, and beyond the Stour. The Ackling street is the only considerable work that can be attributed to the Romans.

The camp is composed of three lines of banks, each with an external ditch. The banks may be from 30 ft. to 40 ft. high above the bottom of the ditch, and about half that height above the ground immediately within or in their rear. As the ground rises towards the centre of the camp, each line of bank is somewhat higher than, and commands, those beyond it.

The central enclosure is of large area, about 300 yards in diameter, the inner and the outer about 600 yards, and contains 18 acres. The annular spaces between the inner, middle, and outer rings are of variable, but often considerable, breadth. The average diameter of the whole is about 600 yards. There is no mound or central work, as at Old Sarum, and no trace

of any special citadel or reserved space for the commander, other than the inner moat circle. Unlike Old Sarum, the outermost ditch has no bank upon its counterscarp, from which the ground falls away with an easy natural slope.

There are two entrances, east and west, on opposite sides. The smaller, that to the east, is a mere gap in the banks, the ditches being also interrupted. Through the two inner banks the opening is direct. That in the outer bank is placed a few yards to the south, so that the lower part of the entry is oblique, and the road within commanded by the middle bank.

The western is the principal entrance, and its arrangements are very peculiar. The inner bank has a simple gap or opening, but the middle bank is thrown forwards so as to form a flat oblong bastion, about 80 yards long, with a projection of about 10 yards. In each of its flanks is an opening, leading into the outer area or ward. The exterior bank has no such projection, but a few yards south of the southern opening it is cut through obliquely. There does not seem to have been a corresponding entrance to match that in the north flank. Thus the enemy, had they passed the outer entrance, would find themselves in front of a rather formidable bastion, with a deep ditch, in the flank of which are the two entrances into the middle ward.

Finally, on this side, is a direct entrance, at least 40 ft. broad, cut through each bank, and through the centre of the great bastion. This is evidently a later work, and as it proceeds from the Achling ditch, here a very few yards from the camp, it is probable that this entrance was cut by the Romans to allow their legions and their baggage an easy entrance into a fortification that they may be supposed to have occupied. In one place the middle ditch seems to be connected with a spring of water, and there is a damp spot in the inner area, near to which two modern ponds have been formed. No doubt with care water might be obtained and preserved without sinking to any great depth. The area contains a few depressions that may be either water-tanks or the pits of wigwams, or both. There are no traces of Roman habitation or encampment.

Badbury has been the subject of much speculation, but nothing is certainly known concerning it. It is evidently a British work, with which, from the proximity of their road, the Romans must have been well acquainted. Eadward the Elder is said to have taken post at Badbury before his successful attack upon Æthelwald in Wimborne. Badbury gives name to a Hundred. The syllable "Bad" belongs to its original name, and it cannot be a subject of wonder that antiquaries have tried, though unsuccessfully, to claim it as the Mont Badonicus of Arthur.

THE DEVIL'S SPITTLEFULL.—The remarkable knoll, designated in the Ordnance map, and known locally by this unsavoury name, stands about equidistant from Stourport and Kidderminster, a mile and a quarter south-east of Bewdley, and a short mile east of the Severn. It is, therefore, in Worcestershire, though unnoticed in its county history, and it belongs to one of the hamlets of the extensive parish of Kidderminster. A short distance south of it is the "Dropping Well," the waters of which were reputed sovereign for diseases of the eye.

This is a new-red-sandstone district, having the rock always near the surface, and sometimes rising through it, as at the "Spittlefull." Usually, however, it is covered up with a red sandy soil, derived from the rock, and sprinkled moderately with quartzose and other pebbles, such as are found in great abundance near the Lickey. The general surface of the country bears special indications of having been moulded by water, and is studded all over with rounded hills and hillocks, some so sharply defined as to appear to have been the work of man.

One of these hillocks, though too large and too irregular to allow any doubt as to its origin, is the subject of the present notice. It is a mass of soft red rock, somewhat lunated in plan, formed into a ridge at its summit, which is about 100 ft. above the plain, and about 200 ft. in length. The ends towards the north and south are somewhat higher and broader than the central part; and the southern, rather the higher, is about 25 ft. in diameter. A little below its top, in a low cliff, is a small cave, probably of no great age. The rock crops out everywhere at or near the summit, but a little way down is covered up with a "talus," or slope of earth, steep, but never precipitous.

So far there is nothing to show that the knoll has ever been used as a residence or for defensive purposes; but that it was so used is rendered certain by the presence of a ditch about 40 ft. lower, and full of water, which is evidently artificial, and embraces the hill on its south, east, north, and a part of its western sides. At one end, the south-west, the ditch ends abruptly; at the other, towards the north, it expands into a reedy marsh, about 100 ft. across. The space intervening between the two ends of the ditch is about 5 ft. above the level of the water. It bears no trace of having been excavated, and was no doubt left for the entrance. Towards the south-east the ditch is traversed by a narrow causeway of earth, which may be modern.

Beyond the ditch, a few yards to the east, is a patch of broken ground covered with Scotch firs, which may have been an outwork, though this is doubtful. To the north and west the ground rises, and at a few yards in that direction is a small circular pool, planted with willows, and which looks old. The main knoll is covered with Scotch firs, mingled, along the foot of the slope, with some large beeches. The wood may be of seventy or eighty years' growth. Altogether this is a very curious knoll, and though local history, as expounded by Dr. Nash, is silent concerning it, it is unquestionably a natural moated mound, and has been employed as a place of refuge, inconvenient no doubt, but strong and secure.

ASTON, SALOP.—At Aston, about three miles south-west of Ludlow, and two miles from Richard's Castle, is a moated mound of the type of Richard's Castle and Wigmore, and wholly artificial. It is conical, flat-topped, and about 17 ft. high. Its flat top is about 27 yards in diameter, and its base about 60 yards. It is surrounded by a ditch, which still contains water, and in parts is about 10 yards broad, so that the whole work covers a circle of about 80 yards diameter. There are no traces of any outwork beyond the ditch. There are no foundations or remains of masonry here, nor any tradition of a castle. The mound is about a furlong north of the parish church.

MINTON, also in Salop, on the Long Mynd, near Church Stretton. Here the mound is small, and the circumscribing ditch shallow. The tradition is that it was one of the mounds thrown up to protect the dwellers on the borders from the inroads of the Welsh. It was cut across a few years ago, and shown not to be sepulchral.

RASTRICK, in Yorkshire, is said to be a corruption of Rath-rig. Here was a fine moated mound, which was destroyed by the extension of a quarry a few years ago.

Mr. Hunter mentions several moated mounds in his History of Hallamshire, among them are,—

CASTLE HILL, a fine mound near Bradfield, having a ditch.

BAILEY HILL, also near Bradfield. Here is an oval area, covering an acre, defended on one side by a steep natural slope, and on the other by an artificial bank, 110 yards in length outside and 80 yards inside. There is also an entrance ditch. At one end of the oval is a narrow entrance, at the other a conical mound, 174 yards in girth at its base and 80 ft. in height. The ditch proper to the mound is about 10 yards broad. There are no traces of masonry.

CASTLE HILL, at the junction of the Sheaf and the Don, was the seat of Swayn, the dispossessed Lord of Sheffield. The English Aula was succeeded by a Norman castle, built probably by the Lords Furnival in the reign of Henry III., when Thomas de Furnival had a "licentia crenellare." A few vaults are said to mark the site of the castle. It contained a chapel.

TENBURY.—The Burh upon the Teme, whence the town takes its name, still remains, though apparently much reduced in its dimensions. It is known as the Castle-tump, a name which preserves a tradition of high antiquity, since there was no Norman military structure on this spot. The Burh is placed upon the north bank of the river, close to the water, and upon a level meadow, subject to occasional floods. Its present aspect seems at first sight rather sepulchral than military, its flat top having become rounded by age, and its ditch in great part filled up. The mound, wholly artificial, is not more than 10 ft. high, and about 44 ft., measured on the surface, from its centre to the foot of its slope. The ditch may be traced on the river side. It is a mere shallow depression, about 12 ft. wide and, perhaps, 30 ft. from the foot of the slope of the mound. As is usually the case, the church is near, though on the other side of the river; there are some old and very fine oaks on the mound.

BURGHEAD is the name of a headland of the county of Elgin, which projects into the Moray Firth, and protects from north-eastern blasts the small bay of Findhorn, at the bottom of which are the opening of the river and the loch of that name, and the town of Kinloss.

Burghead is, by Scottish antiquaries, identified with the Roman station of Pteroton, and Chalmers mentions the discovery here of a Roman bath. Pteroton is thought, also, to have been a seat of the Vacomagi, one of the subordinate tribes of the north of Scotland during the Roman period.

The village is built upon the root of the headland, which it completely occupies. Between it and the actual head, which is also the highest point, the ground is covered by the camp. In outline this work is somewhat irregular, but its sides, as now seen, are nearly straight lines,—that to the north about 500 ft. long, that to the south 600 ft., with a mean breadth of about 250 ft. Along the north front the bank is about 20 ft. broad at the top, and beyond and below it the ground falls steeply towards a second bank, about 50 ft. below the first, and composed of loose stones. Beyond and below this is the sea. The well, lately discovered, is old.

The bank along the south front is now destroyed, or very nearly so; and upon and below its slope are built some small houses, and at its foot is a quay from which project two rude piers, affording shelter for small fishing-boats. The western or seaward end of the inclosure is the highest part of the promontory, and ends in a sea-cliff of about 70 ft. The other or landward end is replaced by houses and a modern road.

General Roy gives a plan of the headland, which it is difficult to reconcile with present appearances, or with the description of Chalmers in the *Caledonia* in 1798. Both, however, describe two camps as then existing, and Chalmers says that one of them was defended by planks of wood, cased with stone and lime.

They also agree that, common to the two camps, and cutting them off from the village, were lines of banks and ditches, crossing the headland from sea to sea. Roy shows four ditches and three banks. The whole area, thus fortified, might be about five acres.

Judging from present appearances, the whole work might be Roman, although it may very well have been occupied and altered by the Scandinavian rovers, to whose galleys the port would have afforded convenient shelter. It is stated that the local name of the place was Teryton or Torytown, a tempting approximation to Pteroton.

For illustrations see next page.

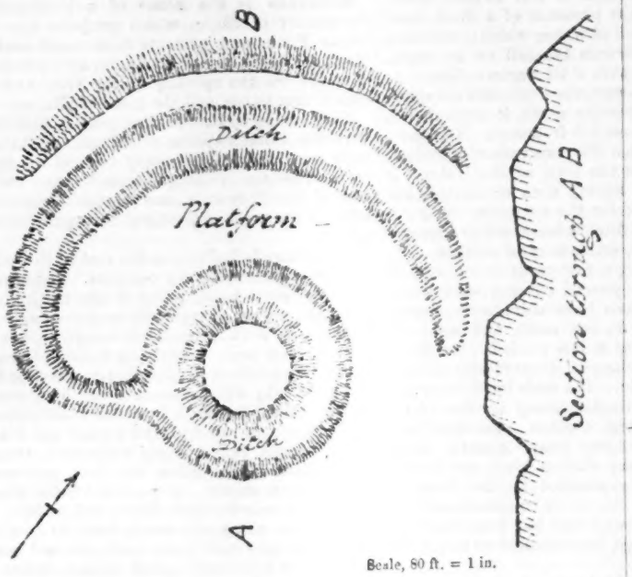
COMPETITIONS.

Exeter High School for Girls.—The competition designs,—thirteen in number,—for these schools have been on private view at the Castle at Exeter. The drawings are all shown under mottos, but it is believed they are all, or nearly all, from local architects. The stipulation is that the cost does not exceed 5,000*l.*, and premiums of 25*l.* and 15*l.* respectively for the best two designs are offered. The drawings are shown under the mottos, &c.:—A circle within triangle, inside circle (Tudor); "That our daughters may be as corner-stones, polished" (Geometrical); "Cultus" (Queen Anne); "Fiat Justitia" (Geometrical); "Finire quærentem Labores" (Tudor); "D.V." (Geometrical); "Compliance" (Domestic Gothic); "Economy" (Queen Anne); "Desideratum" (freely treated); "Place aux Demoiselles" (Tudor); "Je suis en mesure de la faire" (Geometrical); "Justitia" (Elizabethan); and "Choose well,—your choice is brief yet endless" (Queen Anne). No decision has yet been arrived at.

New Markets, Jersey.—On Thursday in last week the Jersey Markets Committee, after examining the designs submitted for the construction of new markets, adjudged the first premium to Mr. T. W. Helliwell, of Brighouse, Yorkshire, in conjunction with Messrs. Bellamy & Hardy; and the second to Messrs. Bromilaw & Cheers. Mr. Helliwell is known to our readers as the inventor of the system of glazing which bears his name, and is coming largely into use.

Architectural Metal-Work.—This was the subject of a paper read before the Birmingham Architectural Association on Tuesday evening by Mr. J. W. Tonks.

NEWCASTLE, NEAR MONMOUTH.

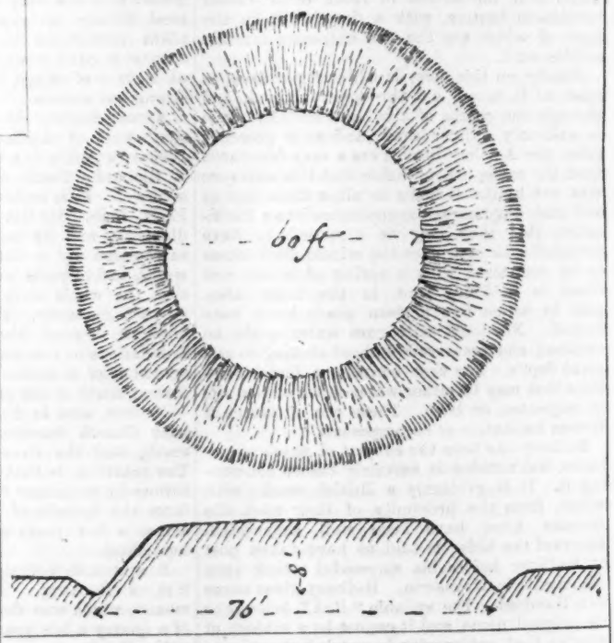


Scale, 80 ft. = 1 in.

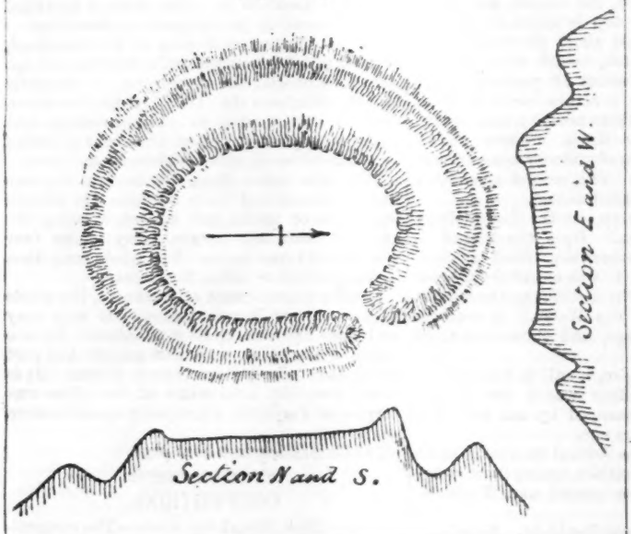
SUTTON WALLS.

Scale, 160 ft. = 1 in.

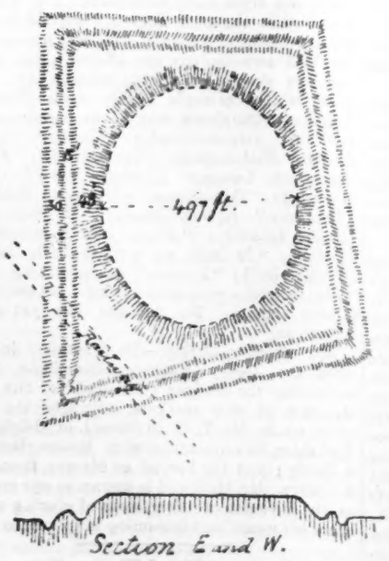
HOWTON.



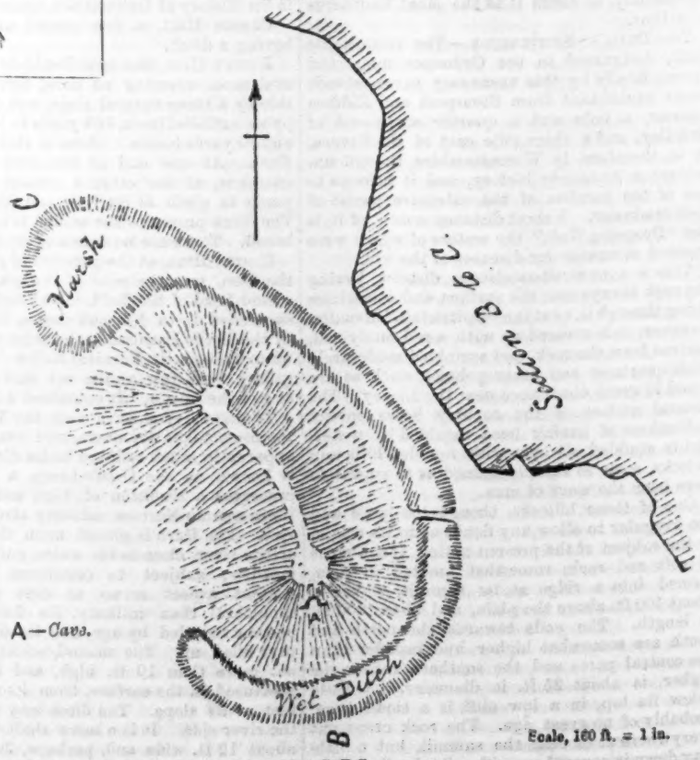
PENRICE.



LLECHRHYD.

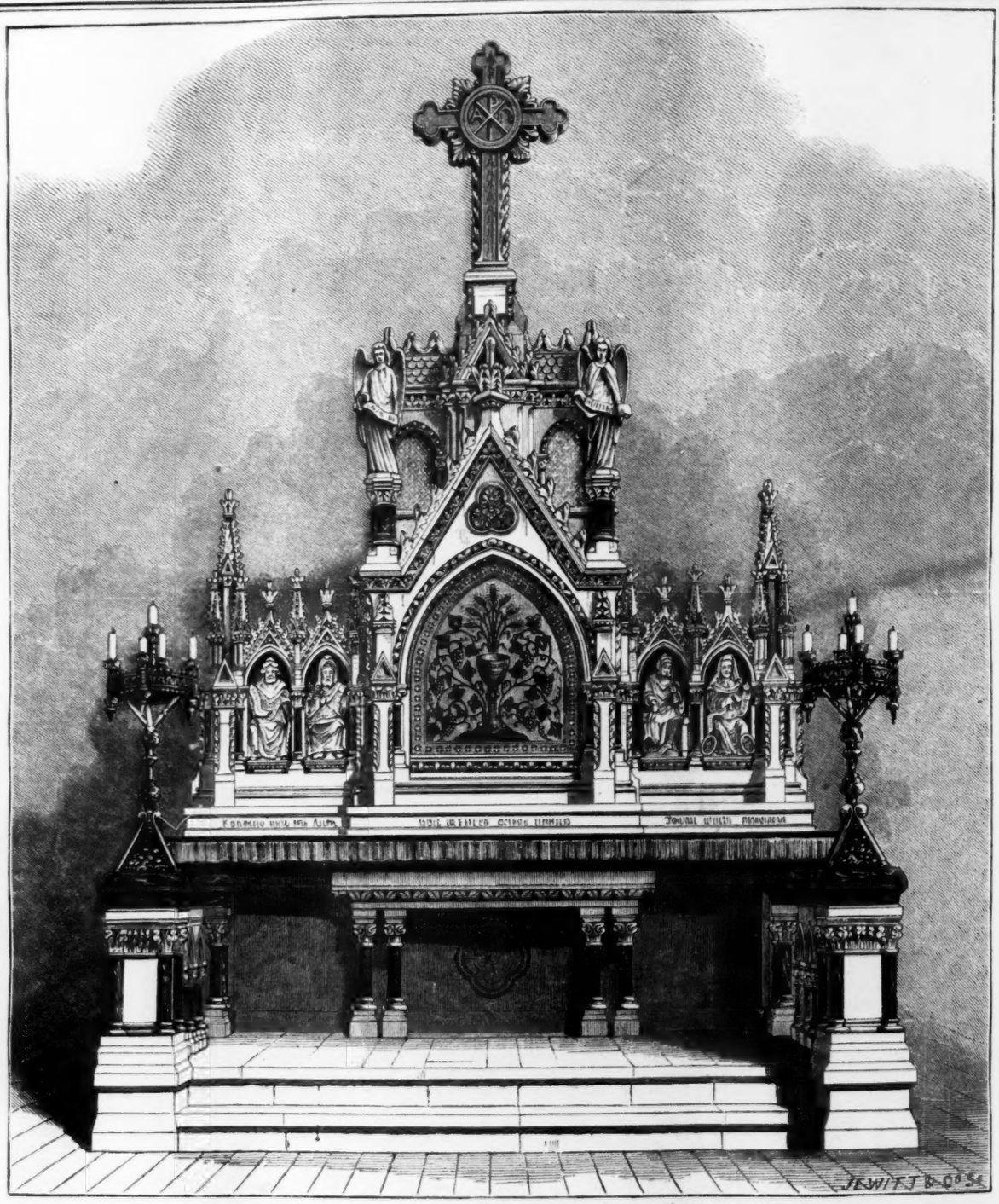


DEVIL'S SPITTLEFULL.

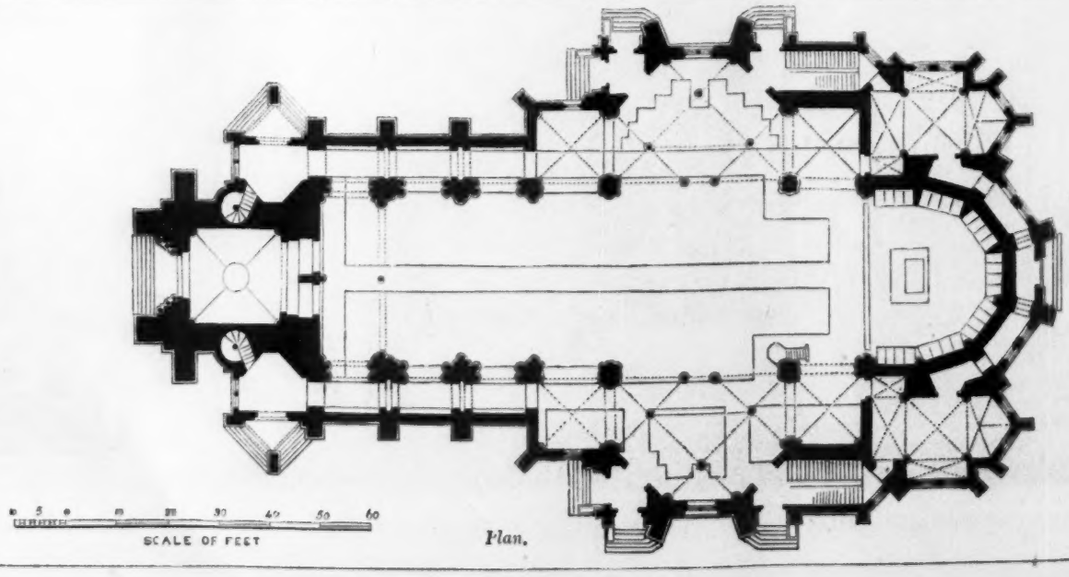


Scale, 160 ft. = 1 in.

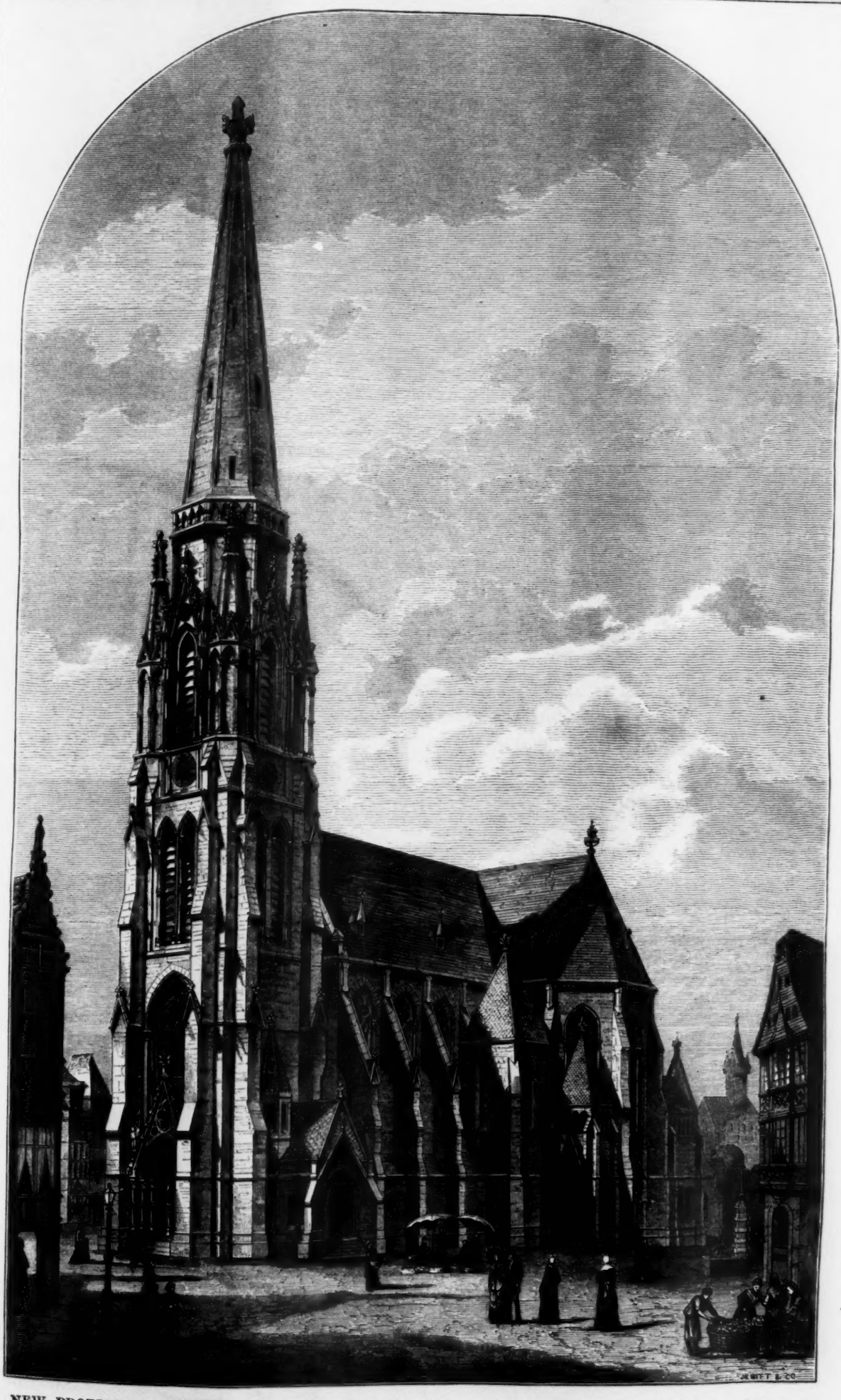
EARTHWORKS IN ENGLAND AND WALES.



NEW PROTESTANT CHURCH AT BOCHUM, WESTPHALIA: REREDOS.



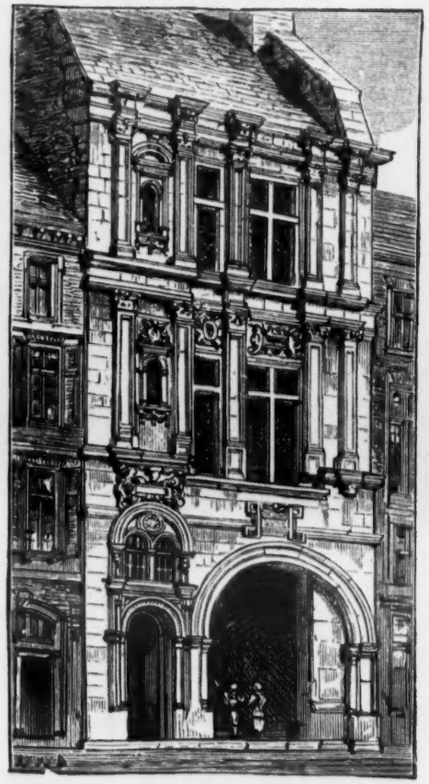
Plan.



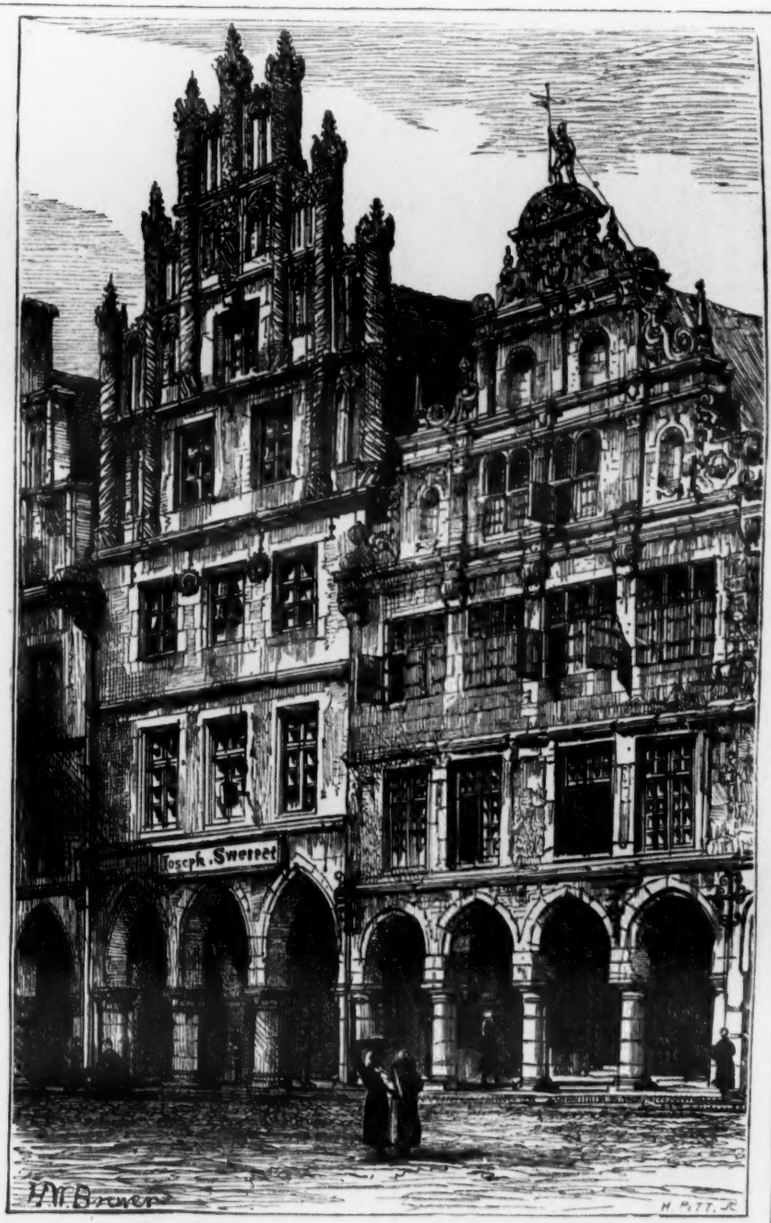
NEW PROTESTANT CHURCH AT BOCHUM, WESTPHALIA.—HERR AUGUST HERTEL, OF CREFELD, ARCHITECT.

No. 2. *Houses in the Market Place, Brussels.*

No. 4. *Inn at Kriegshaben, near Augsburg.*



No. 3. *House with Shop, at Orleans.*



No. 1. *Houses at Münster, Westphalia.*

PROTESTANT CHURCH AT BOCHUM, WESTPHALIA.

THE Evangelical community at Bochum,—one of the most flourishing industrial towns of Westphalia,—which, in its rapid rise to importance, has few equals, had felt severely, for some time, the want of a commodious place of worship. When therefore the two separate Protestant congregations existing in Bochum united, in July, 1876, the construction of a suitable house of prayer was made one of the conditions of the union.

Competition for a suitable design being invited, in 1876, twenty-five designs were sent in, and the plans of Messrs. Hartel & Quester, of Crefeld, were selected. Herr August Hartel, the author of the building of which we present an illustration, is a disciple of the present architect of the Cologne Cathedral, Herr Franz Schmitz; he also worked under Professor Raschdorff, now in Berlin, and he has been for some years the guiding spirit of the above firm of architects. The Evangelical churches at Crefeld and Viersen are his work; he received also prizes in the competition for a church for Blumenthal, near Bremen, and for the large church of St. Peter, in Leipzig. The building of the latter church, which is to be proceeded with shortly, with some changes in the original plans, he will superintend, in conjunction with the eminent Leipzig architect, Herr C. Lipsius.

The church with which we have to deal in the present number was erected in the years 1877-79, and may be considered a precursor of the intended Leipzic church. The foundation stone of the new church at Bochum was laid on May 15, 1877, and the building was handed over to the congregation on May 8, 1879. In this church the great object has been to group the congregation round the pulpit, without in the least encroaching upon the altar-space. This arrangement had been previously carried out in the Crefeld church, and found practicable, while it does not detract from the acoustic properties of the edifice, the minister being equally well seen by the whole congregation, both when officiating at the communion-table and when delivering his sermon from the pulpit.

The style of the edifice is that of the Early Gothic. It is erected in brick, with an exterior of freestone. The architectural parts of the interior are in sandstone. The interior fittings are handsome, the altar, organ, pulpit, and other parts being good specimens of German art industry. The cost of the erection is about 25,000*l.*, and this is not thought to be excessive.

THE DOMESTIC AND CIVIL ARCHITECTURE OF GERMANY.

ARCHITECTURAL ASSOCIATION.

IN the discussion which followed Mr. Brewer's paper on this subject, published by us last week,

The President (Mr. S. Flint Clarkson) said he thought the Association was highly privileged in having had so interesting a paper read to it by Mr. Brewer, who was so well known as an illustrator of German architecture. Few, if any, of the illustrators of the art of other countries had devoted so much attention to German architecture as had been given to it by Mr. Brewer with so much success. Although the subject of the paper was not one which admitted of discussion in the sense that there was a "Yes" or "No" about it, yet there were a few points which might be considered. One point was as to the reasons why the Renaissance in Germany was delayed for so long a period after it commenced elsewhere. From the commencement of the Renaissance in Italy nearly a hundred years elapsed before the erection of the portal of the Rath-haus of Cologne. The paper had afforded indications by the way of Mr. Brewer's views (which he was afraid would be regarded as heterodox by some members of the Association) as to advantages of varied styles in one and the same building. The curious coincidence of the circumstances of German architecture in the period treated of by Mr. Brewer with our present custom of almost uniformly adopting the Gothic style for our ecclesiastical buildings, and with the tendency to use the Renaissance in some form or other for civic buildings was also worth noting. One very interesting point brought out in the paper was the survival of the Romanesque style in Germany during the Mediæval period, not only in details or accidental suggestions, but really, as Mr. Brewer seemed to think, as a phase of art which had never become obsolete at all.

Mr. H. L. Florence, in proposing a vote of thanks to Mr. Brewer for his paper, said it was sad to hear that in twenty or thirty years hence the greater part, if not the whole, of the interesting ancient domestic buildings referred to will have been swept away in the name of "improvement." Had any effort been made to prevent the destruction or to form any record of the interesting buildings which were even now disappearing so rapidly? He was aware that in Vienna there was a society something like that constituted by the Association's "Sketchbook" Committee and contributors, principally carried on, he believed, by the pupils of Prof. Schmidt, but the efforts of that society in sketching old buildings were, he thought, confined strictly to its own locality. It was evident that if architectural tourists did not soon visit Germany, there would not remain much for them to see in the way of old domestic buildings. He had seen enough in Germany to make him wonder that more English architects did not travel there. Of course, all architectural tourists knew the Romanesque architecture of the banks of the Rhine, because the Rhine formed part of a great high-road to Italy, but very few had penetrated, as Mr. Brewer had done, into Central and South Germany.

Mr. W. Hilton Nash seconded the vote of thanks, and said that a very interesting district not touched upon by Mr. Brewer was that of the banks of the Moselle. In that district alone there was sufficient to repay the time and cost of a summer's trip. The ancient domestic architecture of that locality was full of picturesqueness and beauty, and presented many features which might with advantage be adapted to modern use. Mr. Brewer was deserving of the warmest thanks of the Association, not only for his interesting paper, but for the large collection of his beautiful drawings with which it was illustrated.

Mr. John Sulman supported the motion, observing that he could confirm, if confirmation were necessary, all that had been said as to the interesting field which Germany afforded to the architectural tourist. One town not mentioned by Mr. Brewer was Linz, just below Cologne, and full of picturesque buildings, amongst which the gate-towers were particularly worthy of mention. What he had seen of German architecture only made him long to see more, and Mr. Brewer might usefully supplement his paper if he would be kind enough to indicate a few leading routes for architectural tourists in Germany. Mr. Brewer's drawings only served to make all architectural students who had once visited Germany say, in the words of a well-known hymn,—

"We have been there and still would go."

The Chairman having put the vote of thanks to the meeting, it was agreed to with much heartiness.

Mr. Brewer, in replying, said Mr. Clarkson had referred to the continuation of the Romanesque style through the whole of the Middle Ages in Germany. That would be rather a long subject to enter upon fully, but he might call the attention of the meeting to one or two remarkable facts. In the first place, some of the churches of what was called the district of Sächsischen-Siebenbürgen dated from the fourteenth century, yet were perfectly Romanesque. He would also call attention to an extraordinary thing in connexion with the cloisters of Trèves Cathedral, which were as Gothic in general effect as Westminster Abbey, and dated from the fourteenth century, yet every arch in them, and every light in every window, was semicircular-headed. There was a church at Ecternach which was one of the most curious examples he had ever seen. It was a strange jumble of Late German Gothic work, with all the broken inter-penetrating tracery which the German architects loved, but with heavy Romanesque cornices supported on little semicircular arcades. He could refer to a great many other examples which would seem to show that the Romanesque style continued to live side by side with the Gothic during the whole of the Mediæval period. Mr. Florence had inquired whether any steps had been taken (he presumed he meant by the German Government) to protect the interesting old buildings. Unfortunately, the Government *did* undertake the protection of the buildings, but if they would only leave them alone, they would fare very much better. One of their wonderful pieces of protection was at Boppard, where the towers of the church were connected by a kind of bridge,* probably the work of the fourteenth century, the towers being of thirteenth-century work. A Government architect, who had never before seen the building, came post-haste from Berlin, and immediately ordered the destruction of the bridge. The inhabitants protested, but in vain. Again, with regard to Nuremberg, there were Acts of Parliament protecting its buildings, and providing that no old buildings were to be altered, and even stipulating that new buildings were to be erected in the old style so as to avoid incongruity; but, nevertheless, the town had been cut in half by the formation of an immense boulevard, and surrounded by Brummagem Gothic houses. The needless destruction of old buildings all over Germany was something lamentable, and he advised intending architectural tourists to go there as soon as they could, or they would find nothing worth seeing. The change for the worse since the Franco-Prussian war in the aspect of the German towns was only too apparent. The new houses seemed to be built of rubbish and brickbats. They were six or seven stories high, and covered with a horrible kind of plaster. Why they did not tumble down he did not know. He thought the best hint he could give to tourists was to advise them always to keep close to the large rivers and their tributaries,—to the Rhine, the Maine, the Moselle, the Lahn, the Moldau, the Danube, &c. As long as they kept to the rivers they were sure to come across interesting towns, but if they left the rivers they would only find a series of uninteresting and unpicturesque villages. The reason why these presented such a contrast to the larger towns was probably to be found in the fact that the latter were built on the banks of rivers for convenience of water-carriage, and, on account of the wealth they contained, were surrounded by walls for protection from enemies. The villages, on the other hand, were simply agricultural settlements, and, being unprotected, were burned down or otherwise destroyed during that dreadful scourge the Thirty Years' War. In choosing railway routes in Germany, the architectural tourist would find it desirable always to select lines which ran as nearly as possible at the sides of the rivers, bearing in mind, however, that where the rivers deviated much from a tolerably straight course, the railways very frequently cut off great bends of the rivers, the bends so cut off generally containing towns of more interest, from their comparative seclusion, than those on the line of the railway. The subject of German domestic architecture was a very large one, and in his paper he had only been able to glance at it, necessarily omitting mention of many interesting towns,—Linz among others. In conclusion, he thanked the meeting for the kind way in which his paper had been received.

THE RESTORATION QUESTION: CARLISLE REFECTORY.

WE have received copies of a correspondence between the Secretary of the Society for the Protection of Ancient Buildings and Mr. G. E. Street on the subject of the course about to be pursued by the latter in restoring the Fratry at Carlisle. We print the architect's reply, which includes a statement of the objections raised by the Society:—

Carlisle Refectory.

As I think the objections of your Society to all restoration of old buildings, when applied to such a building as this, quite demonstrably absurd, I have not the slightest hesitation in saying so. The question is simply this: Are the owners of old buildings to be allowed to

* A similar bridge, connecting the two western towers of the cathedral of Limburg-on-the-Lahn, is shown in the view (drawn by Mr. Brewer) published in our volume for 1877, p. 1225. From the description given of this bridge on p. 1227 of that volume we reprint the following passages:—"One of the uses of this gallery or bridge is obvious enough. It, of course, saved the expense of a staircase in both towers. It also saves the trouble of going down to the ground and mounting another staircase when it is necessary to go from the bell-chamber in one tower to that in the other. We may venture to hazard a third use. There can be no doubt that at all times during the Middle Ages church towers were used in extreme cases as places of defence. They were, in fact, the very last strongholds of the besieged, and church-plate, valuables, manuscripts, &c., would, in case of necessity, be placed in the tower which had no staircase. The wooden bridge or gallery could easily be thrown down, and they would be placed in a position almost inaccessible, for a time at least." These towers, with the connecting bridge, are also shown in Mr. Brewer's view of Limburg-on-the-Lahn, published in our last volume, p. 916.

use them or not? If they may use them, they must repair them. I believe Mr. R. S. Ferguson has no warrant whatever for fathering the two windows I have removed on Mr. Machell, or on any one else. They are identical with two windows in a house near the gateway to the close, on which is the date 1699, which are there still, and open to study and inspection. Whoever inserted them did so because at that time the fratry was being subdivided by floors and walls into a number of rooms; and whilst he opened some new windows, he blocked some old ones, without any regard to anything but his own ideas of convenience. He tore down also a good deal of old masonry, and built it up in a new wall which I have taken down; and as the old stones are all exactly worked for certain heights of courses, we know exactly whence they came, and are carefully putting them back again in their old places, with the old masons' marks restored to view. The two windows of 1699 were singularly bad specimens of their age, and, what is more important, they were inserted with grave risk to the stability of the structure, and in the meanest and most careless manner. The whole wall above them was carried upon slight wooden lintels. In one window the lintel had been propped with a huge pier of brickwork, which could not safely be removed, and the other window not being so supported and blocked inside, was in a dangerous state until I had it shored up. These two windows were twice the size of the windows above them, and were, with ingenuous ignorance of the risk involved, inserted under the piers instead of under the windows. On structural grounds, therefore, no honest or practical architect would allow such openings to exist a day longer than could be helped. And now allow me to say that I should like your Society to explain to us why, if it was lawful for Mr. Machell (or some one else) to block some windows and open out others in 1699, it is not lawful for me to do the same thing now in 1880? His alterations ended by obscuring every feature of interest in the interior of the building; mine will end by exhibiting every old feature of interest, and in its old place and state. One part of the "history" of this building was made in about 1808. At that time three canopied niches were removed from the east wall, and put as ornaments against the north wall, being fixed in front of the old north windows. I am "ruthlessly" going to put these niches back in their old place, above the dais, and to open the blocked-up windows. I know your Society will be sorry to hear of this "ruthless" alteration of the existing work, but as the Dean and Chapter wish me to be responsible for the work, I fear I must take the course which my experience and common sense suggest without regard to the feelings of your Society. In the same way, part of the history of the fabric was made a few years ago by the introduction of some rather eccentric stone props under the groining of the crypt. These, I understand, were executed from the designs of the brother of your correspondent, Mr. Ferguson, who used to be surveyor to the Chapter, and I feel myself obliged to take them away, and to rebuild this damaged portion of the crypt exactly on its old lines. Again, in the same spirit, I am going to take away a doorway inserted some fifty years since by Sir Robert Smirke, in order that I may be able to restore a very fine fourteenth-century doorway, of which we have discovered the base and jambs in their original place below Sir Robert Smirke's work. Smirke's Gothic work bears precisely the same relation to good Gothic work that the two 1699 windows do to good Italian or Renaissance work, and as he was born in the eighteenth century, I fear your Society will be grieved to hear of this last act of Vandalism of which I am guilty.

When the refectory is restored I shall look forward to the day when a cloister may also be built, following the old lines, and it would give me, I cannot say how much, pleasure to restore (as I could), from the fragments that remain, the ancient octagonal chapter-house. In my opinion such works as these are desirable and in every way to be encouraged. And the Dean and Chapter of Carlisle are to be congratulated on having the proper sense of their duty shown by their determination to remove all the unsightly walls and floors and ceilings, which have been formed in their magnificent refectory, and to restore it to its old state. No one who knew its late state, and who still retains a grain of common sense, could doubt for an instant the propriety of the course they are adopting, in what you call a "ruthless destruction" of a page of "local history." It is a history of barbarous destruction of which no one, I believe, in Carlisle (not even Mr. Ferguson) is proud.

I must have lived and worked in vain for a good many years if it is necessary for me to refer to the assumption in Mr. Ferguson's letter that I am going to reface the external walls of this interesting building. As to the "venerable and interesting associations," "the loss of which you deplore," I, of course, can only regret that your society is so hopelessly at issue with me as to what associations deserve such adjectives. To you all the miserable and pitiful alterations which have been made in a noble building, the walls which have divided its interior into a number of rooms where there was only one intended by the founder, the lath-and-plaster linings to the walls, the mean plastered ceilings, the concealment of the beautiful and perfect pulpit, and the ruinous state of part of the crypt, appear to have venerable and interesting associations; for no doubt great men have gone in and out of these poverty-stricken rooms, and good works have been done in them. But I am an architect and an antiquary; I have all my life been devotedly fond of ancient buildings, and to me the "venerable and interesting associations" were all wrecked when impious hands set to work to mar every feature of this noble refectory. Fortunately (from my point of view) it rests with me rather than with you to decide in this case which class of associations really deserves consideration at our hands at this time. I cannot say how glad I am, for the sake of the building, that this is so.

I have written at some length on this occasion, but I must in conclusion say that I do not understand why you should demand such explanations from me. You *must* know by this time what my architectural practice is, and I have not the slightest intention of giving it up at your request. George Edmund Street.

GREAT PUBLIC WORKS SANCTIONED IN FRANCE.

We called attention some little time since to the large expenditure on which the French Government had resolved for the completion of the internal navigation of France. We now give a brief analysis of the scheme from official sources.

In November, 1878, the Minister of Public Works presented to the Chamber of Deputies a Bill relative to the classification and improvement of the navigable waterways of France,—a measure which was regarded by the Government as the necessary sequel to the law as to the completion of the railway network. Both of these projects were received with great favour by public opinion.

The report states that time and experience have entirely removed the erroneous idea, at one time entertained, that the construction of railways would render canals useless. The remarkable reports of M. Krantz, made to the Assemblée Nationale in 1872-73-74, pointed out that the improvement of the waterways was a primary condition of success in the restoration of the industry and commerce of France. They showed the proper function of canals in the circulation of traffic, and defined the steps which were necessary for the completion of the network of inland navigation.

The Senate adopted the same ideas, and in a report, drawn up by M. Hubert de Lisle, sent to the Minister of Public Works in November, 1878, demanded a development of the canal system corresponding to that given to the railway system.

Canals, the report goes on to say, present, without any possible contestation, the most economical means of transport, and in other respects supply various wants. There is a class of merchandise, consisting of heavy and cumbersome articles, of low intrinsic value, such as coal, minerals, cements, building stones, lime, manure, &c., which furnishes the most considerable amount of tonnage, and for which a low price is an essential condition of transport. In spite of the great reduction of railway tariffs, transport of these articles is still so dear by railway as to be rendered in many cases impossible. A week or a fortnight more or less in the delivery of these objects is unimportant, in comparison to a difference of one-half in the cost of transport, allowing them to be sold at all points on the French territory as cheap as, or even cheaper than, foreign merchandise of the same nature.

Thus coal, which is an indispensable element of industry, which can be transported by canal for the price of ·220 of a penny per ton per mile, cannot be carried, even for long distances, by railway, for less than from ·540 to ·620 of a penny per ton per mile; that is to say, for more than double the cost by canal.

The essential feature of the canals is their aptitude for cheap transport; and their development is the more necessary because the railways, in spite of their powers, are inadequate to suffice the commercial movement of the time; if an opinion can be formed from the example of the district of the north of France, where the traffic is divided almost equally between the canals and the railways.

Lighterage has thus immense service to render to the country. If the saving of from ·320d. to ·380d. per ton per mile on the enormous tonnage which is carried by water be considered, it may be boldly concluded that the considerable sums required for the construction and improvement of canals will not be expended without profit to the national wealth.

The works for which sanction is sought by the Government apply to the total length of the inland water-ways of France, that is to say, to 7,500 miles, and the cost contemplated amounts to about 33,000,000*l*. The sum is considerable, and will be increased to about 40,000,000*l*. by additions to the original project.

The cost cannot be definitively fixed until the surveys are complete. It need not cause alarm to the Chamber, because the execution of the programme will depend on the resources annually placed at the disposal of the Minister of Public Works.

The first clause of the Bill divides the waterways of France into two classes, those of principal and secondary lines, according to the importance of the needs which they supply, and the consideration of whether they are of general or only local advantage.

The principal lines will be administered by the State, and will be incapable of concession. The secondary lines may be conceded, for a limited period, with or without subvention, to companies or to individuals. On mature consideration, the Commission confirms this classification.

The provisional aggregate of 37,140,000*l*. does not include the sum necessary for the purchase by the State of six principal lines of waterway, now the property of companies or individuals, amounting to an aggregate length of 445 miles. The Commission insists on the utility of this purchase, more especially on that part which concerns the navigation from the ocean to the Mediterranean and to the Rhône, the greater part of which, the report states, is, by an unjustifiable error in public economy, now in the hands of the Compagnie du Chemin de Fer du Midi. The Canal du Midi and the lateral canal of the Garonne together amount to a length of 302 miles.

Succeeding clauses determine the priority and the mode of execution of the several works. The expense of the original project is recited as about 33,200,000*l*., which the additions made by the Commission will raise to 37,200,000*l*.

CLUMBER: SEAT OF THE DUKE OF NEWCASTLE.

A misstatement in a popular periodical, to the effect that the reconstruction of Clumber was in the hands of the late Professor E. M. Barry, has led to some inquiries, and even hopes that might have been spared. As a rule, we do not profess to correct the errors of other journalists, but in this case it may prevent inconvenience if we say that the architect entrusted with the work in question is Mr. Charles Barry, F.S.A., and that the matter is well in hand. This mansion has heretofore consisted of two parts, an original structure on a small scale, especially in respect of height of rooms; and considerable additions at later date of more palatial character. The fire which occurred some time ago was chiefly confined to the older parts, and will lead to a great improvement of the building as a whole.

A Presentation.—On Monday, February 23rd, the *employés* of Messrs. Trollope, from the joiners' shop, assembled to present Mr. Elvey with a timepiece, as testimony of their esteem on his retiring from his position as foreman, which situation he had held for over thirteen years. A suitable address was read.

ARCHITECTURAL COMPETITIONS.

SIR,—I have read the report of the discussion on "Competitions," at the Institute of Architects, and was glad to see that an outsider was invited to unfold his views.

I may, or may not, agree with the opinions expressed by Sir Edmund Beckett on this subject, but I certainly think that a more general admission of outsiders to the discussions of our various architectural societies might help to widen the views of architects, and make our course less speedy towards that unhealthy exclusiveness to which some sections of the profession seem bent on voyaging.

When "Honorary Associates" can catch up that tone of contempt for the profession which is heard but too frequently in other quarters, such a body as the Institute might do worse than consider whether there are grounds for such a feeling. The members of a profession who are touched at all points by such a matter-of-fact question as that of "building" might fairly be expected to be supersaturated with a broad practical common sense. Are we credited by the general public with any such quality?

It should be self-evident that, with the profession in its present state, it is worse than idle to spend time in discussions with the hope (implied or expressed) of "stopping" competitions. As things are now constituted, the most that we as architects can do, it seems to me, is to bring "moral suasion" (a poor suasion at best) to bear on one another to raise the general tone, and cut short the supplies of competitive material where the "conditions" are such as would not meet with the general approval of practising architects.

Some time ago the *Builder*, in reviewing the conditions of a prospective competition, characterised them, if my memory serves me aright, as "disgraceful," and hoped that no architect would respond. Well, amongst others, a member of one of our respectable architectural societies (are not all these societies respectable?) entered into this disgraceful affair with such an excellent spirit as to win, and was not at all anxious to hide the fact of his success. This is but one out of the many disreputable incidents which will readily occur to the minds of practising architects, and will go far to account for so many members of our profession, like myself, keeping themselves aloof from all societies.

Professor Kerr holds to the opinion that, if there is to be any satisfactory troubling of these competition waters, it must come from the Institute. I could more readily agree with such an opinion if I could believe that this particular London society was not of so limited a character as it is, and had a more direct hold of the profession at large than it has.

I quite think it is of small use a little society here, or a little society there, attempting to deal with such a question as that of competitions. What we want is one central body embracing the great bulk of our architects, rendered powerful by numbers, and powerful by money; for unless both these conditions can be secured, we had better cease talking further on the question.

In your report of the discussion which followed the reading of the paper, I see no proposals which, to my mind, seem likely to influence materially the character of future competitions. I beg, therefore, to offer the following suggestions for the consideration of those interested, and would preface my remarks by saying that I speak as an architect who has competed with a fair measure of success; but as I have for some years given up competing altogether, I stand on somewhat neutral ground.

I would propose:—

1. That the Royal Institute of British Architects (by preference as being the oldest-established society) should take measures to induce the great body of architects practising in the United Kingdom to enroll themselves as members, and thus become amenable to its regulations, and direct subscribers to its funds. I presume that with a liberal form of constitution and the adoption of measures to bring the objects of the society directly before each individual member of the profession, it would not be impossible to secure, say from 4,000 to 5,000 members, from amongst architects who have practised for a minimum period of seven, or even ten years; and this number might be largely augmented by Associates.

2. Let each member (old or new) be required to contribute a sum of 5 or 10 guineas, and associates 1 guinea, as may be determined, towards the initiation of a permanent fund, the interest from which shall be devoted exclusively to dealing with the question of competitions and grievances which affect us as architects. It ought in this way to be possible to secure a capital sum of 45,000*l.* to start with, the interest of which at 4½ per cent., would give an annual income of, say 2,000*l.*

3. Let there be appointed a firm of solicitors and a firm of architects, working conjointly, whose business it shall be to investigate and report upon the "conditions" issued for all future competitions (affecting the architects of the United Kingdom), with powers to take such action for the interests of the profession, in each particular case, as they may deem fit. These firms, working together, should be empowered to investigate and report upon any grievance or any unprofessional conduct alleged against a member of the society.

4. Let the firm of solicitors be paid the sum of, say, 600*l.* per annum, and the firm of architects a like sum for their services. This would leave a balance of 800*l.* per annum for travelling, printing, and other necessary expenses. If this fund should not be found large enough for the purposes in view, then let it be increased. As personal investigation on the spot would, in many cases, be desirable, things not being always what they seem, this would of necessity lead to considerable outlay.

Should the foregoing suggestions meet with some measure of approval, it would not be difficult to work out the details of the scheme. At any rate, this communication will afford an opportunity of ascertaining whether, after all, there really is any deep and honest feeling in the profession on the competition question.

A PRACTISING ARCHITECT.

THE TELEPHONE FOR BUSINESS PURPOSES.

THE use of the telephone is beginning to be understood. We have recently met with two or three applications of it. The communication that has been established by Messrs. Treloar & Sons, of Ludgate-hill, City, and their cocoa-nut fibre mat and matting factory in Southwark, is one notable illustration, amongst others, that may be referred to as showing the capabilities of the invention as applied to business purposes; greatly transcending, although with limitation as to distance possibly, those of its forerunner, the electric telegraph. Conversation can be conducted through the telegraphic wires, but less rapidly and satisfactorily than *vivâ voce* through the telephone, and unless the advantages of a private wire are possessed, each message by telegraph requires, in transmission, one errand from the sender to the telegraphic station; another back with the answer, with the same errands at the receiver's end. The messages require also to be written out, and in some instances to be transferred from one wire to another. With a private telephone the communication is direct, and, for practical purposes, instantaneous. No preliminary practice or drill whatever is needed to enable any person to use it with complete success at the first trial. The apparatus and mode of working are exceedingly simple. The termini have lengths of flexible wire, covered with silk, attached to the main wire; a small listening cup is attached to the ends of the flexible portions. When the cup is hooked on the face of the instruments the contact is broken; when the cups are unhooked, those who may be around in the rooms or places reached by the two terminals are *en rapport*, and a person listening at one end may hear distinctly several persons speaking in the room at the other. When a question or message is sent, the sender may occupy any position, and may speak in his ordinary voice; when he receives a question or message, he applies his ear to the small cup before referred to. Messrs. Treloar's telephone, which crosses the Thames, is about a mile in length; every syllable spoken at one end, and even the modulations of the voice, are heard at the other end with perfect distinctness. The value and convenience of such a rapid and trustworthy means of communication between the sale-rooms, at which orders are taken, and the manufactory in which the goods are made and where stock is kept, will be readily apparent, as also the saving of time and trouble to both the tradesman and his customers that its use is so well fitted to effect. With such a communication as this, which is not used for the transmission of messages for hire, or used in any way outside the purposes of the firm, the Postmaster General can, of course, have no better right of interference than in the matter of a speaking-tube between two rooms in a suite of offices.

THE PARKES MUSEUM OF HYGIENE.

DR. STEELE, of Guy's Hospital, gave a demonstration on "The Hospital and Sick Room" at the Parkes Museum on the 14th inst. Dr. Steele introduced the subject by referring to the apparent antagonism between the terms hygiene and the sick-room, but explained that while it was the object of the medical art to cure disease, it was equally the aim of hygiene to maintain health, and in their dual capacity of warding off death the one may be said to be the handmaid of the other. In the sick-room the lessons we had learnt in health had a double significance, first in teaching us how we might best assist Nature in her attempts at recovery from an unnatural condition, and, secondly, by limiting or entirely preventing the extension of this abnormal condition to others. He instanced especially the necessity for pure air and an abundant supply of it for the sick-room, and illustrated this part of the subject by the various models in the museum of the windows of the chief London hospitals, which are so constructed as to admit the largest amount of air with the smallest perceptible draught. Of the various apparatus for artificial ventilation in the museum, preference was given to that invented by Messrs. Verity Brothers, which, through the agency of a fan propelled by a jet of water, continuously furnishes a measured quantity of pure air to a chamber. The various appliances for the application of heat, cold, and moisture to the body generally and locally were separately dealt with, and illustrated by the valuable collection of articles presented to the museum by Messrs. Maw, Son, & Thompson. What promises to be an interesting and very instructive department of the museum, viz., the sick-bed and its equipment, next came under consideration. The various forms of invalid bedsteads and mattresses were passed in review, together with the numerous appliances for aiding and raising the helpless invalid in order to have his bed made or wounds dressed. Lastly, the uses and abuses of various disinfecting agents for the sick-room were discussed, and while it was shown that the best of them, viz., chlorine and sulphurous acid, could not be effectively employed in a chamber so long as the patient occupied it, much might be done to circumscribe contagious disease by the adoption of stringent precautionary measures of isolation. Such had been carried out with great success in many parts of Kent by trained nurses under the supervision of Mr. Timmins, the rector of West Malling, and his rules were well worthy of adoption by other nursing associations.

A hearty vote of thanks was passed to Dr. Steele, on the motion of Mr. Taylor, of the council of the Working Men's Club and Institute Union.

SIR JOHN SOANE'S MUSEUM.

A MEETING of the trustees of this Museum was held on the 19th inst. at the house in Lincoln's-inn-fields, at which were present Prof. Donaldson, Mr. Frederic Ouvry, F.S.A., Mr. David Mocatta, F.S.A., Mr. Alderman Thomas Q. Finnis, and Mr. Alan Cole. It was decided that during the forthcoming months of April, May, June, and July, the Museum should be opened to the public on four days instead of three days a week, such days being Tuesday, Wednesday, Thursday, and Saturday.

Art Prize Competitions.—A large number of works were sent to the editor of the *Magazine of Art* from all parts of the United Kingdom, and many of them evinced considerable talent and study. The judges (Mr. H. S. Marks, R.A., Mr. Luke Fildes, A.R.A., and Mrs. Louise Jopling) decided to consider the general composition and best rendering of the story rather than technical excellence of execution. After examination, they awarded the prizes as follows:—First prize, 10*l.*,—Albert G. Morrow, aged 16; second prize, 5*l.*,—Helen Lamb. The proprietors decided to present an extra prize, an art book, to H. R. Steer, whose work was considered third in order of merit.

THE EDUCATION OF THE WORKMAN.

Not many years since "obsolete" might have been found in our dictionaries printed against the word "technical," but of late this word has been resuscitated and pronounced trippingly on many tongues. "Technical education" has become a "cry"; but though it has become a cry, it is difficult to obtain any precise definition of the intentions of its advocates. Their project would appear to be a very quicksand, on which no solid and satisfactory explanation may rest.

This cry has proceeded from men who have no thoroughly practical acquaintance with the requirements of workmanship, and who have therefore confused and confounded the education needed by the *brain-craftsman*, who either invents, contrives, or designs, and the handicraftsman, who executes, who brings the material into the conditions and measures the former requires or directs. Now, these two functions require essentially different kinds of education, and the indiscrimination of the advocates of technical education would force the knowledge needed by the master on to the workman, and would make a kind of amphibious being, neither perfectly adapted to direct nor to execute. To render the projects of these technical educators feasible, it is necessary to decry English workmanship,—that workmanship which has made England famous in the marts of the world, and which has been the very envy of the Continent. To reward the manufacturer and artisan for winning us wealth and renown it is now unblushingly proposed that a Royal Commission shall be issued to inquire into the organisation of the English workshop, in order that the *dilettanti* may meddle with and ultimately turn it inside out, take apprenticeship into their own hands, &c. Let us hope, for the credit of the English workshop, that no such Royal Commission will be issued, to cast a still further slur than the technical educators have already done upon the manufacturer and artisan, by treating them as if they were incompetent to deal with their own affairs, and as if they were the worst, instead of the most enterprising and skilful, in the world.

There can be very little doubt that the entire educational system of the country, from the Universities to the Board Schools, requires revision. But I deny that the workman's education is, in his degree, any worse than that of the other classes of the community,—nay, in some respects, the workman has great advantages from an educational point of view; his education may not be so formal as that of the wealthier classes, but then it is divested of classical burden and old-world prejudices, and much of it has to be self-earned, and this is ever the most valuable portion of education. It may be urged that in his trade-unionism he shows his ignorance and blindness to his own and others' interests. But it may be noted that that so-called "higher education" which has been vouchsafed to the wealthier classes through the modern centuries has not prevented them from also being blind to their own and others' interests, or from entertaining the most egregious fallacies. In fact, the world overrates the power of formal education and "cramming"; a far more important matter, the systematic training, or the making of the man mentally and physically, has been, and is still, overlooked, though that would be the true preliminary to all good work.

Did the technical movement come from within the sphere of the workshop, we might lend more heed to it, but it does not; it would seem to have proceeded from our still barbaric fondness for imitating foreigners, for we are always being exhorted by those having technics on the brain to imitate France. "Look at France!" France and her technical education is the bogey which they are eternally and madly shaking in our manufacturing faces. Well! France has been for years in the possession of those technical institutions which our Job's comforters would have us adopt, and if the reader desire to learn with what results, let him read an abstract of the reports of the artisan reporters on the last Paris Exhibition, wherein he will find that the English manufacturer and artisan are, in the main, pre-eminent. These technical institutions of the Continent are due to political and manufacturing conditions entirely different to our own, and to a movement on the part of foreign Governments to force their artisan populations into competition with us. But with all these appliances, which are for the most part pretty models of the English workshops, there is, as yet, no overwhelming evidence in favour of our adopting them. It would be a work of supererogation. Such institutions may be copied and set up anywhere; but there is no valid reason for deserting our own old private way of striving after excellence in the manufactures.

We have heard a good deal of "adult instruction by museums," and yet our adult would-be technical reformers miss the most important item of museum instruction, viz., that the finest work of which these museums are the depositories, was executed without any such technical system as is now proposed for adoption. This fact ought in itself to convince these innovators that good workmanship depends on something quite different to what they suppose. Even science itself comes of a mental aptitude above the science itself, of a mental method and training which is not only the parent of science, but of true art and good workmanship. Technical skill does not come of a knowledge of science, but of the training of the eye and the hand in the workshop. A perfect piece of work might even be performed without the workman himself knowing for what purpose it be intended. Very little good can possibly accrue from the mechanical committal of the sciences to memory, for it should be recollected that the getting-up of a science from lecture or book does not stimulate those faculties necessary to either the framing or improving of a science, and does not at all contribute to that kind of training which is essential to the performance of good work. The pursuit of science with reference to its improvement is an all-absorbing speciality and business in itself. We want the workman to be proud of his own calling, and not to desert this for something else, unless, indeed, he feels that he has some uncontrollable promptings in some other direction, and when this is the case he generally finds the knowledge he requires; for it is under such stimulation that learning is productive. Without this vitalising purpose little comes of "cramming" a quantity of knowledge. We have said that good workmanship comes of training the hand and the eye, the senses of touch and sight, of perfecting, if I may so express it, the human mechanism. Now, when should this training be attempted,—in youth, when the system is plastic and modifiable, or after maturity, when the system is set and less modifiable? In youth, most assuredly; and it is for this reason that I have maintained that the training in the School Board schools should be so framed as to lead up to the training of the workshop; and this training, I have pointed out, would be the best preparatory training for any phase of life.

I would not debar the workman from taking that interest in science and art which other men of culture take in them, but that interest is quite a different thing to making these studies of such serious moment as to interfere with the workman's real business in life. But I would have no amateur departmental workshops after the fashion of the Continent; nor would I permit any meddling with the workshop proper; the manufacturer and the artisan are quite competent to deal with its organisation. If they be not, it is a hopeless case; for then no extraneous intervention whatever could possibly be of any avail.

With the inventor, contriver, or designer, science-teaching is a very different matter,—the application of science and art to industry is his business: he requires a more intimate knowledge of theory, and it was for his advantage that I proposed to the Royal Commissioners for the application of the surplus fund of the Exhibition of 1851 the institution of a grand central technic college at South Kensington, which would have eclipsed all other universities in the teaching of pure and applied science. It is this project which has cropped up again and again, but without those who have revived it fully understanding its purpose.

In my various letters and lectures upon the subject in hand, I have attempted to inculcate the necessity of discrimination in the provision of extraneous technical education, to direct willing effort to those points where it would not be uselessly applied. Of the three parties to the production of work, the one who *demands*, the second who *adapts* to demand, or the *inventor, contriver*, or *designer*, and the third, who executes, or the workman; I have shown that the first two require more opportunities for instruction; the first in taste, and in what good workmanship consists; and the second in scientific principles. But even in these cases we have to recollect that a formal course of instruction would be a comparatively dead letter, unless behind that there were the natural aptitude. It is to this we owe the advancement of the arts and sciences. Advancement in art, science, and workmanship commences where formal education ends.

Of the City guilds, the Cutlers' has set the wisest and best example by "trying back" to their ancient functions. In doing that, they would all, in my opinion, best promote good workmanship. We should recollect that wealth and effort may be misapplied; and if misapplied, thrown away, when a little more discrimination might turn both to profitable account.

W. Cave Thomas.

GLASGOW MUNICIPAL BUILDINGS COMPETITION.

Mr. John Honeyman, in a letter relative to the proposed competition for the new municipal buildings, says:—

"I assume that the citizens of Glasgow are interested in the subject, and that there is a general concurrence of opinion that the designing of such an important building should,—for the credit of the city, the comfort of those who are to occupy it, and, I may add, the comfort of those who must pay for it,—be entrusted to an able and experienced architect, and since a competition has been determined upon, the question immediately pressing is,—How can the greatest number of men of this class be induced to compete? Some people seem to think that the offer of a few large premiums, however objectionable the conditions may be in other respects, will draw designs from the most eminent members of the profession,—an utter and ridiculous mistake. Such an offer will, no doubt, draw designs from a few men of experience, who happen to have nothing else to do; from 'speculative architects' who 'go in' for competitions right and left, and somehow make a living by it; from 'pushing architects,' who calculate on success through unblushing mendacity and the assiduous application of personal influence; from embryo architects, who have done nothing, or next to nothing; and even from draughtsmen, who have done less. Such are the competitors who may be attracted in this way; but men in good practice,—men who may therefore be assumed to be competent,—will stand aloof. Now, it is worthy of remark that in dealing with any other profession, the shrewd business men of Glasgow know better than to employ inferior men in cases of importance or difficulty; they seek the best advisers, and pay them handsomely. They certainly would never dream of asking such men to cut down their fees, or to do anything else inconsistent with their proper self-respect, or degrading to their profession, because, forsooth, there are hundreds of less fortunate and more needy practitioners who would only be too thankful to be employed on these or almost any terms. Architects desire and deserve the same consideration; and architects of good reputation will not submit to any different treatment. Some of these may be expected to compete for such an important building as the new municipal buildings if the conditions of the competition are reasonable and fair, but not otherwise.

What, then, are the regulations which generally prevent men of high standing from engaging in competitions? They are,—1. The large number and the large scale of the drawings required. 2. The absence of any guarantee that the author of the best design shall be employed as the architect of the building on the usual terms. 3. The absence of any promise that an impartial professional assessor shall assist in adjudicating upon the plans. 4. The stipulation of an inadequate sum for the cost of the building. The first of these objections was happily met in the case of the Manchester Townhall competition. Sketch plans to a small scale were first invited from all and sundry, and many eminent men sent designs. About half a dozen of the best were selected, and the authors of these were asked to illustrate their designs fully to a larger scale, each being paid a handsome sum to cover their expenses. In this way several admirable designs were obtained, and the building, as now completed, is not only a credit to the city, but to the nation. I shall only add a word or two about the fourth objection. The

honest architect who knows his business, if he competes, tries to do what he is asked; the unscrupulous and the ignorant do not. Their aim is to catch the fancy of the judges, believing (as experience warrants) that if their design is chosen the financial difficulty will be got over somehow. The honest man, therefore, has obviously no chance, unless the sum named is ample, or unless no sum is named. . . . . If a certain amount of accommodation must be provided, it is not of the slightest consequence to the community whether a limit of expenditure is specified or not; the most skilful architects will in any case most carefully avoid extravagance and prevent wastry, which is all that can be hoped for. The cost of the building will depend almost entirely on its size, and the competitor has no more control over that than over the fluctuations of the timber market or artisans' wages. . . . . Nothing more effectually debars an experienced and honourable architect from engaging in a competition than such arbitrary restrictions as to cost, which he would feel bound to respect, while others, inferior it may be, but less conscientious, despising them utterly, would be preferred before him. In such circumstances he knows that he has really no chance of success, and he will not take the trouble to compete.

I have no idea what are to be the conditions of the proposed competition, but I venture to make these few remarks on this much misunderstood subject in the hope that they may come under the notice of the Committee on New Municipal Buildings before they decide upon these conditions."

BRECON DRAINAGE.

THE works for the drainage of Brecon were finished and handed over to the Town Council officially last week.

The contract comprised about eight miles of sewers, with special flushing arrangements and syphon, under the river Usk; also duplicate sewage-tanks, and the laying out of about six acres of filtering-ground for the sewage.

The works have been completed (three months within the contract time) by Mr. J. Mackay, contractor, of Swansea, under Mr. Rhys Davies, the borough surveyor, with Messrs. Gotto & Beesley as consulting engineers.

NEW BUILDINGS IN BUCKLERSBURY.—THE GRESHAM.

AMONGST the several new buildings in the City, in the immediate neighbourhood of the Mansion House, is one which was opened on the 14th inst., and which, both by its name and architectural features and decorations, may be said to perpetuate the memory of Sir Thomas Gresham. The structure consists of a restaurant, which has been erected for Mr. Lake, from the designs of Mr. C. A. Gould, who, however, did not live to see his work completed, having died a few months ago. The name given to the buildings is "Ye Gresham," which is carved above the entrance in Old English characters. The elevation is in red sandstone, and, though limited in width, is lofty, and seen to advantage from Queen Victoria-street, being situated at the angle of that thoroughfare with Bucklersbury. The frontage consists largely of mullioned window space, which is carried across the whole of the ground-floor and three upper floors, and surmounted by a prominent gable, inclosing a recessed arch, containing the fourth-floor windows. There are carved pilasters at the angles between the several floors, together with carving and sculptured heads in other parts of the frontage. Internally the walls of the ground and first floors are faced with cream-colour enamelled tiles, interspersed with figures in painted tile work, representing, on the ground floor, the seasons, and food, fruits, and flowers, the floor being laid with ornamented tiles, in varied patterns. The mural decorations on the first floor, which contains the principal dining saloon, consist of a full-length figure of Sir Thomas Gresham, with numerous busts of illustrious poets and writers, including Shakspeare, Milton, Byron, Scott, Hood, Thackeray, and Dickens, together with allegorical figures on other parts of the walls of the apartment, all in painted tiles, the whole of the mural portion of the work, and the encaustic tiles on the ground floor, having been executed by Messrs. Saunders & Co., of Endell-street. The fittings throughout are in polished walnut and oak.

The contractor for the building is Mr. Warne, of Blackfriars-road.

DR. CARMICHAEL ON THE TRAP AND WATER-CLOSET SYSTEM.

A MEETING of the Philosophical Society of Glasgow was held on the 18th inst., — Dr. Fergus in the chair,—when a paper on "The Trap and Water-closet System" was read by Dr. Neil Carmichael. That gentleman explained in the course of his remarks that for a considerable period he has been making experimental investigations into the trap and water-closet system, and the relations of the same to sewage products, gaseous and others; and as a result he had come to the conclusion that germs and other substances injurious to health did not pass through a sound water-trap. Clearly, then, he said, they must look to other sources for the contaminations of the atmosphere which were frequently to be found to prevail in houses, and which proved so serious and injurious to health. He had ascertained from experiments that an opening made by a small pin in a soil-pipe was sufficient to admit particles into a house that were dangerous to health and likely to spread disease, and when they considered how imperfect some of these pipes were in many respects, it was no difficult matter to account for the presence of noxious gases in dwellings. While he admitted that the water-closets in general use, where the traps were perfect, were not so objectionable as some people were disposed to assert, still there belonged to them the serious objection that between the pan and the trap there was a portion of soil-pipe, which was never or rarely free from objectionable matter, and therefore was a fertile source of annoyance and danger. He thought an effort should be made in the waterclosets of the future to get rid of this objectionable feature. Dr. Carmichael exhibited a diagram of an improved watercloset, which he conceived removed all cause of complaint in the direction he had indicated.

The chairman, in moving a vote of thanks to Dr. Carmichael, remarked on the enormous amount of labour that gentleman had bestowed on the subject of which he had treated. He knew no one whose experiments were more trustworthy, or who bestowed more care and attention on the conduct of those experiments. The paper was thereafter favourably criticised by several of the gentlemen present.

THE LOST TENDER.

AT the meeting of the Court of Common Council, on the 19th inst., the General Purposes Committee presented a report, in which they said,—

"We have duly proceeded in the reference, and were attended by Mr. G. N. Johnson, the mover of the reference, and also by Mr. C. W. Hindley, and Mr. Scrimgeour, on behalf of the firm of Messrs. Hindley & Son, whom we severally heard. We also heard the Architect, Mr. Gosling, and Mr. C. J. Lovell, of the Architect's department. Having given our careful attention to the evidence which was given before us, your committee beg to report that it appears to our satisfaction that Messrs. Hindley's tender was delivered in the Architect's office, but what then became of it it appears impossible to ascertain, and your committee desire to add that in their opinion every effort has been made in the Architect's office to discover the missing tender. With respect to the general mode of receiving tenders by the Corporation, it is in our opinion desirable that the following regulations should be adopted in future: That a suitable box or boxes, with locks and keys, for the reception of tenders, be provided, and placed in the office of the hall-keeper, the keys to be deposited with the Town Clerk; that the time for the reception of the tenders to be the full hour before the meeting of the committee to consider them, and that during the hour named an official, deputed by the hall-keeper for the purpose, do attend and see every tender properly deposited in the box by the person delivering the tender. When the committee by whom the tenders are to be considered has been formed, the box shall be brought in from the hall-keeper's office. The Town Clerk shall then hand the key to the chairman, who will open the box, and take out the tenders."

The report was adopted.

Royal Albert Hall.—With the sanction of H.R.H. the Duke of Edinburgh, the Royal Albert Hall Amateur Orchestral Society will give a concert at the Hall, on the 6th of March, in aid of the National Hospital for the Paralysed and Epileptic, Queen-square, Bloomsbury. We have before now spoken strongly of the value and claims of this institution, and shall hope to find some of our readers assisting it on the 6th of March, especially as in doing so they are likely to enjoy a very agreeable evening.

A CRYSTAL PALACE AT MARSEILLES.

DURING the course of next April a place of amusement of no ordinary dimensions will be opened at Marseilles, in the Rue du Théâtre Français. This establishment is called the Palais de Cristal, and will cover altogether an area of 1800 square mètres. The idea recalls the Théâtre de Bellecour of Lyons, which we described at length in these columns, but the building will be put to even a greater number of uses. Masons have been at work during the whole of the winter, and in spite of the cold weather, the walls are now completed. The centre of the building will consist of a huge concert-room, surrounded by two elegant galleries, and so contrived that by removing the board floor it may be converted into a circus. From the *café*, glimpses through arches will be obtained of this brilliant concert-room, the distant sounds of harmony will reach the idlers who sip their evening *demi-tasse*, and tempt them a step further. To this central building are attached two wings, one giving on the Allies de Meilhan and the other on the Rue du Théâtre Français, where a monumental façade is in course of construction. There are rooms set apart for public meetings and balls, together with a skating-rink, a café, a restaurant, and an elaborate hot-house, where, it is stated, varied plants are to be cultivated. A great variety of entertainments will be organised, and 3,000 persons can stroll through this large building without inconvenience or overcrowding. The hall, containing a skating-rink in its centre, will also prove a great attraction. It is surrounded by five full centre arches, resting on twenty Corinthian pillars. Above these large arches will be a frieze, pierced by seventy-six bays or openings, separated by pilasters and alternated by caryatides supporting the cornice and the crown-work or summit. The ceiling, 220 mètres square in size, is to be lighted by daylight; and at night, by a combination of gas and electricity, while powerful reflectors will add to the intensity of the illumination. On one side of this hall there is an orchestra for sixty performers, and in another wing a second and larger *café*, together with cloak-rooms, will be found. The tables of the restaurant will be placed under the shade and foliage of rare plants and trees. The amount of iron required for the framework of the glass, roofing, &c., is estimated at 150,000 kilos. The general enterprise has been confided to Messrs. Alphaise & Dray, building contractors, the joinery department to M. Perrault, the ironwork to M. Bonnet, and the wood scaffolding to M. Guilleminot. The apparatus for the manufacture of gas and the electric light is in charge of M. Rizzo, civil engineer. M. Royau is the sculptor, and the well-known firm of Messrs. Appy, Portal, & Co., the decorators. The front of the galleries and balustrades will be of crystal, from the firm of De Gueylar, of St. Marcel, and the walls, and even the floors, are to be entirely covered with glass. Messrs. Desmolins & Mollaret are the principal promoters of this great venture, and they have secured the services of M. Sixte Rey, to whom the town of Marseilles is indebted for many noble constructions, as the architect. As Marseilles is a station where so many travellers rest for a day or two, a place of entertainment of this description will not fail to receive much support from foreigners, while the prominence given to musical performances will please the native Provençal, who above all things appreciates good singing. If, as is proposed, the new docks are built, the commerce and population of Marseilles will increase rapidly, and institutions of this description will become more necessary than at present.

"WESTMINSTER MARBLE WORKS."

SIR,—We notice in your issue of the 21st instant a paragraph referring to a sale at the works of Messrs. Poole & Sons, in Johnson-street, Westminster, which being inserted under the above heading, is calculated to be injurious to our interests.

Our establishment has been known for nearly a century as the "Westminster Marble Works," and is the only business carried on under this name. We shall feel greatly obliged, therefore, if you will allow us to make known, through the medium of your columns, that the paragraph in question in no way relates to our establishment, at which no sale has taken place.

T. H. HARTLEY & CO.

Royal Society.—Cards for the annual *conversazione* to be held April 28th have been issued. There will be undress receptions on March 3rd and April 7th.

A BUILDER'S DAUGHTER.

THE late Miss Jane Steele, of 7, Park-place, Clifton, who died on the 6th of this month, has by her will bequeathed the following legacies, all duty free:—

The Bristol Royal Infirmary, 1,000*l.*; the Bristol General Hospital, 1,000*l.*; the Bristol Blind Asylum, 1,000*l.*; Müller's Orphan Asylum on Ashley-down, 1,000*l.*; the Bristol Deaf and Dumb Institution, 1,000*l.*; the Blue School for Girls on Redcliff-hill, 1,000*l.*; the Bristol Dispensary, 200*l.*; the Eye Dispensary in Orchard-street, 200*l.*; the Hook's Mills Orphan Asylum, 200*l.*; the Strangers' Friend Society, 200*l.*; the Society for Promoting Christianity among the Jews, 100*l.*; the Bible Society, 100*l.*; the Church Missionary Society, 100*l.*; the Church Pastoral Aid Society, 100*l.*; the Bristol Penitentiary, 100*l.*; the Bristol Cathedral Restoration Fund, 300*l.*; the incumbent and churchwardens of St. Thomas's Church, Bristol, in aid of the restoration or repairs of the church, 500*l.*; the incumbent and churchwardens of the same church, the interest to be applied in aid of the income of the incumbent for the time being, 1,000*l.*; the vicar and churchwardens of St. Mary Redcliff Church, Bristol, in aid of the restoration or repairs of the church, 300*l.*; the vicar and churchwardens of the same church, the interest to be applied in augmentation of the payments made to the poor inmates of the almshouse at the foot of Redcliff-hill, 1,000*l.*; the vicar and churchwardens of Temple Church, in aid of the repairs of the church, 500*l.*

Miss Steele's father was a builder, and resided in Redcliff parish. Several large edifices in Bristol were built by him, amongst them the present St. Thomas's Church. The deceased lady, who was at the time of her death in her eighty-seventh year, and had few or no relatives, has, besides the above bequests, left considerable legacies to private persons.

HOW WILL OUR WORKMEN BE TAUGHT?

SIR,—"Feldspar" in his letter under the above heading, asks for suggestions likely to be useful in the formation of a society having for its object the better education of our workmen in the technicalities of their respective trades. He seems doubtful, too, if the efforts now being put forth in various directions with a view to meet the difficulty are likely to be successful, or meet with proper appreciation from those for whose benefit they are ostensibly intended. That doubt I also share with him, and with him, too, am of opinion that the superior education of the foreign artisan must necessarily be an important factor in the calculations of manufacturers, both at home and abroad.

Knowledge, we are told, is power, a fact which our rivals abroad have turned to good account; but surely they have no right to a monopoly of that article, and there can be no possible reason why we should not enjoy the advantages its possession confers. I think, however, as a working man, I can point to a few of the reasons why we are so behind in that respect, and beg to submit the same for "Feldspar's" consideration.

We all know that employers at the present day are continually deploring what they term "a lack of intelligence amongst workmen," and assert "that in consequence of the superior education possessed by the foreign artisan, they find it becomes more and more difficult for them to maintain their position in the markets of the world." The whole of the responsibility for the above, however, is thrown on the workman, who is repeatedly told "that he ought to devote his leisure time to studying the theory of his own trade, and to the attainment of as comprehensive and thorough a knowledge of all trades, arts, and sciences, which are in any way allied to it, as far as his circumstances will permit." This is a proposition I am not prepared to contest, as I deem it to be the duty of all to make themselves masters of that by which they get their living; whilst there should be sufficient ambition in us all to cause us to look above the ground, and make us desirous of extending our knowledge of things in general, as far as we practically can.

Workmen, however, after their toils of the day, — often severe and prolonged, — desire rest, and it requires great effort on their part to apply themselves to a prolonged course of hard and tedious study of an evening, when they know that, in all probability, their efforts will fail to meet with appreciation, or even recognition, and that all the return they are likely to get for their trouble is probably impaired health, resulting from overtaxing the nervous system.

Though employers raise a demand for a higher standard of intelligence, yet they almost invariably neglect to take any steps to obtain the same; and, in selecting a foreman or leading hand, are often more anxious to obtain a bully to drive the men, as if they were slaves, than to accept the services of a really competent man, able to carry through a job in a manner that reflects credit on all concerned. Which is the most economical in the end I leave for others to decide.

But if employers really wish for better-educated workmen, they have only to put forth a real, and not a fictitious, demand for such, and a supply will soon be forthcoming.

When employers recognise the fact that technical education is a question as much for their consideration, as for the workmen's,—when they show an appreciation of the technical and scientific classes in their neighbourhood by taking an active interest in their management, or by offering prizes to be competed for by students; when they, in short, use their influence to encourage the workman to improve his education, then I am certain a result will be obtained that cannot but be satisfactory to all parties.

If the managers of technical schools can enlist the employers on their side, they have little reason to fear failure. E. WHIBLEY.

SIR,—Although your correspondent, Mr. W. C. Thomas, remarked at the outset of his letter which appeared in your issue for Feb. 7, that the above question might be easily answered, I think he failed to do so satisfactorily. "Feldspar," I should judge, is earnestly seeking the best means of educating his and other workmen, who, he sees by personal experience, greatly need it; yet he is cautious in taking any steps he might suggest, being afraid whether the scheme would fall to the ground like that tried at Manchester. This, I think, is the reason he applied to your readers for advice; but I presume if he had expected to be met by rebuke instead of advice, he would not have applied to them. In his letter Mr. Thomas said that "the workman must educate himself"; the masters have no more "right" to tell him what he ought to do, than he had to tell his "rulers" how they should be "educated."

It is quite true there must be a personal effort made by the workmen themselves to improve their minds, but I think it is equally true that their masters have more than a right: it is their duty to make the road as easy as possible for the advancement of their workmen in the knowledge of the technical and scientific principles connected with their several industries. Is an employer to consider his workmen as unfit subjects for scientific instruction; or is he to think by the diffusion of knowledge among them they would be the more inferior mechanics?

The ancient artisans, it is true, did their work without the direct aid of science, and so did the ancient "brain-workers," but if they had had the aid of science, I hold they would have been in a position to do their work quicker and even better than they did. Science does not tend to lower the qualifications of the artisans, but rather to elevate them both in workmanship and character.

I think we have had the artisans pictured to us too much resembling horses or machines, capable of working, but without thinking faculties, or almost without them. They need not, we have been told, know the scientific principle on which a steam-engine works, as long as they have the drawing to work by. Nobody doubts this, but when we remember that artisans are human beings, possessing a like nature to their employers, being, as a rule, possessors of those cravings for knowledge which characterise the human family, but without the means to a considerable extent of satisfying those cravings, I do not consider we are justified in saying that "persons who believe they have a mission to 'talk' about technical education have not yet learned wisdom," but rather that those persons who think thus have either learned wisdom too fast, thus overlooking its connexion with the working class, or have it yet to learn.

This question has been taken up by many men of deep learning and sound judgment,—as, for instance, the founders of the Science and Art Department and the Society of Arts,—and I think most of your readers will be ready to say with me, that those men possessed some sparks of wisdom.

Mr. Thomas's opinion is, I think, that the working-men should be left as they are, without taking any steps for their advancement, or prospect of rising from "handicraft" to "brain-craft"; but he would provide means for instructing those already engaged in "brain-craft." Probably he forgot that most of the men of whom England has reason to be proud rose from the working-class,—as, for instance, Flaxman, Brindley, and Arkwright; their lives tell us that genius is not confined to the middle class, nor to any other class, but there were, and are now at the present time, some sparks of it even in the working-class. Therefore I think it is the duty of all employers to do what they can in improving the condition of their *employés*.

I would recommend "Feldspar" to conduct a mechanics' institute on such principles as the "Birkbeck Institute" (of course on a smaller scale), and endeavour to teach its members the subjects immediately connected with their industries, which are recognised either by the Society of Arts, or Science and Art Department, and City Guilds Institute, who offer the students good prizes (depending in value, of course, on their success), and very liberal remuneration to the teachers. The artisan-students who have followed the courses marked out by the above societies are now filling the best places, as foreman, &c., and are not found at the public-houses at nights, but at some place deriving useful knowledge. Such men are a credit to themselves and to the country of which they are countrymen, and are justly preferred by most masters to the uneducated men.

OBSERVER.

SOIL PIPES AND RATS.

SIR,—The two communications in the *Builder* of the 24th ult. and the 7th inst. induce me to state that, during last year, in consequence of an unpleasant smell, I had occasion to remove the servants' w.c. apparatus in my house to find out the origin of it, and, to my great astonishment, I found in the lead soil-pipe, just above the lower trap, a hole at least 3 in. over, evidently eaten away by rats. The lead, I must admit, had nearly perished from age, and could consequently be much more easily nibbled at. The gas had found its way upstairs behind the casing.

Would it not be advisable, oftener than is the custom, if the custom exists at all, to see that our lead soil-pipes have not perished by age? The lead in question must have been about forty years old.

I am convinced there is "death in the pot" in a thousand forms, of which we are often totally ignorant, and it is not till its subtle influence has carried off its numerous victims that we awake to the absolute necessity of seeing to it.

H. H. B.

SIR,—Seven or eight years ago I was making extensive alterations for a gentleman, at his house, and in taking down a wall we exposed to view part of the soil-pipe, with the upper portion eaten away, 8½ in. by 3 in. across, evidently by rats; the teeth-marks were very bright and clean-cut. This accounted for a bad odour that was experienced near the butler's pantry at times; but the pipe ran along the centre of a 20-in. stone wall, for 2 yards or so, and lintelled over. Had we not pulled the wall down, it might have remained undiscovered.

H. T. P.

Statue of Lord Gough.—The equestrian statue by Foley, one of the finest of that lamented sculptor's works, has been unveiled by the Viceroy, and has obtained unanimous praise. The statue is 13 ft. 6 in. in height, and stands on a pedestal 7 ft. 2 in. in height, formed of ten tons of gun-metal. The inscription of one side of the pedestal is,—"In honour of Field-Marshal Viscount Gough, K.P., G.C.B., K.G., an illustrious Irishman, whose achievements in the Peninsular War, in China and India, have added to the lustre of the military glory of the country which he faithfully served for 75 years, this statue, cast from cannon taken by troops under his command, and granted by Parliament for the purpose, was erected by his friends and admirers." On the other side of the pedestal is inscribed the name of "Gough." It stands in the Phœnix Park, Dublin.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

AT the sixth meeting of the session, held on the 18th, Mr. H. Syer Cuming, F.S.A. (Scot.), in the chair, it was announced that the Fratry of Carlisle Cathedral was under restoration, and that it was proposed to obliterate the ancient appearance of the building by refacing it with new stone, and also to remove all works of later date than that of the main fabric. A resolution deprecating both these principles was proposed by Mr. Loftus Brock, F.S.A., seconded by Mr. Thos. Morgan, F.S.A., and carried.

Mr. Pinches, of the British Museum, read an elaborate paper on the Terra-Cotta Tablets of Babylonia and Assyria, and illustrated his remarks by several specimens of the various classes, which he deciphered to the meeting. After indicating that stone and bark of trees formed the first writing materials of most nations, he referred to the very early use of clay, at first baked and afterwards unbaked. Some instances of the use of silver records which, 800 years afterwards, were transferred to clay, were named, and others, in stone, which had been recovered with much later inscriptions. The earliest clay tablets are those known as "compacts"; while others have clay cases with the inscriptions repeated on the outside. Some were in form of cones, and placed in cavities of foundations of buildings. At a later period, in Assyria, the tablets were larger, and kept like books, in shelves. The "Correspondent" tablets are of great interest, and one was exhibited, a message from Assurbanipal, to an officer. The "Contract" tablets are filled with figures, and cannot be readily deciphered. The chairman read a paper on a portrait of Henry VI., painted on one of the panels of the rood-screen of Eye Church.

NEW UNITED PRESBYTERIAN CHURCH IN PERTH.

A NEW church is in course of construction in Scotland's ancient capital. It is situated upon the site of a former building, and lies midway between High-street and Mill-street, the principal front facing towards the latter thoroughfare. The roof is now on, and all the exterior stonework is complete. The church is built in a freely-rendered Italian style, and is constructed wholly of a pleasing light-toned freestone. It is a good example of North British masonry. The walls, where no moulded or carved work occurs, are faced with rubbed and sanded ashlar in courses. The outside length is 90 ft., and the breadth 61 ft. The main entrance is approached by a broad flight of steps, over which is a porch 13 ft. by 11 ft., and surrounded by elaborately-carved panels. Both gables are filled in with diaper work, and corbelled labels and skews. In the side elevation are two rows of windows, the lower row is square lintelled and the upper is semicircular-arched, with carved capes. All have circular shafts, with carved tops. In the north gable is a semicircular three-light window, with carved capes and diaper labels. A two-light window of similar design adorns the southern gable, and over it are placed one large and two small circular openings, by which the ventilation of this part of the building is secured. There are two pinnacles on each gable, carried up to the height of the apex, with shafts and carved capitals. The apex is finished with a carved finial. The back gable has two small porches, each with entrances to the lavatories and the church. The pinnacles are 55 ft. 6 in. from the ground to the top, and the apex 35 ft., surmounted with a finial of 4 ft. 6 in. The side walls are 38 ft. high, and reach to the top of the parapet. The body of the church inside is 69 ft. 6 in. long, 55 ft. 8 in. broad, and there is a back gallery 27 ft. 9 in. by 27 ft. The side galleries are 14 ft. in breadth, and run the whole length of the church. Behind the pulpit the organ-loft is situated, which is 27 ft. 6 in. by 10 ft. The ceiling is of octagon-shape, lined with pitch-pine. The interior of the roof of the main body of the church is circular in shape, with large moulded ribs 13 ft. 10 in. apart, filled in with small moulded ribs 2 ft. apart; and the ceiling of the side galleries is divided into five spaces, with arches forming a dome in the centre.

The builders are Messrs. Craig & Auld, of Motherwell. Perth tradesmen, Messrs. Mackay & Sons, plasterers; Mr. A. Davidson, plumber; and Mr. P. Reid, slater, are carrying out their respective branches; whilst the carving is the work of Mr. Harry Hems, of Exeter. The total cost will be between 7,000*l.* and 8,000*l.*; and the building will be completed about Midsummer. Mr. David Geekie is clerk of works.

FATAL ACCIDENT AT LAMBETH.

ON Wednesday morning the premises of Mr. Buckley, timber and firewood merchant, Glasshouse-street, Lambeth, were the scene of a terrible accident, resulting in the death of six persons,—four of whom were women,—and in serious injury to numbers of others. It seems that a few months ago a builder erected for Mr. Buckley a timber structure about 25 ft. square, and intended to serve partly as a shed to shelter the workpeople from the weather, and partly as a staging on which to stack pieces of timber sawn into lengths for conversion into firewood. The framework of the shed or staging was composed of whole balks of timber roughly squared and creosoted, and tied together with dog-irons, the top of the staging being 10 ft. or 12 ft. from the ground. It is claimed that the structure was insulated, and not within the purview of the Building Acts, from the operation of which are exempted all buildings less than 30 ft. high, and of less than 125,000 cubic feet capacity, at least 8 ft. from any street or alley, and 30 ft. from any building. The structure in question is stated to have fulfilled all these requirements, unless the viaduct of the railway be considered a building. The balks of timber forming the staging were 12 in. square, and the weight of timber on top of the structure is estimated at about 20 tons. Whatever may be the precise facts as to these points, it seems that a number of men and women were engaged under cover of the structure in chopping firewood, when they were suddenly buried under the superincumbent mass of wood, owing to the giving-way of the timber staging, caused, it is said, by a subsidence of the earth due to the existence of cesspools, accelerated, it is thought, by the vibration of the railway. Whether this was the real cause, or whether the staging was improperly constructed or overloaded, are points upon which, it is to be hoped, the coroner's inquest will throw some light.

FIRES IN THEATRES.

IN the year 1879 the following twenty-five theatres were completely destroyed by fire:—

Jan. 21. *Elisabeth*, N. Y., U.S.—Clarke's Opera-house.
Feb. 2. *Glasgow*.—Theatre Royal.
Feb. 5. *Neumünster*.—Conventgarten Theater.
March 6. *Reno*, Nev., U.S.—Academy of Music.
March 8. *London*.—Theatre in Royal Polytechnic.
March 16. *London*.—East London Theatre.
March 25. *Derby*.—Keith's Circus.
April 13. *Verden*.—Der Theatersaal.
April 19. *Eurecka*, Nev., U.S.—The Opera-house.
April 19. *Rouen*.—L'Alcazar.
April 24. *Reichenberg*.—Das Stadttheater.
June 20. *Berlin*.—Urania Theater.
July 28. *Pillau*.—Stark's Theatre (during representation).
Aug. 7. *Cagliari*.—Teatro Carboni.
Sept. 7. *Quincy*, Ill., U.S.—Academy of Music.
Sept. 26. *Deadwood*, Dak., U.S.—Union Theatre.
Sept. 26. *Deadwood*, Dak., U.S.—Gem Theatre.
Nov. 16. *Alessandria*.—Teatro Gra.
Nov. 19. *Frankfurt-a-M.*—Adolfi Theater.
Nov. . *Toronto*.—Grand Opera-house.
Nov. 21. *Algiers*.—Théâtre de la Perle.
Nov. 30. *Brussels*.—New Theatre.
Dec. 9. *Stuttgart*.—Circus Herzog.
Dec. 26. *Marienbury*.—Theater im Schützenhaus.
Dec. 30. *Sherman*, Texas, U.S.—The Opera-house.

A. F.

Maninghen Stone.—This stone, which comes from quarries near Boulogne, is now being received in London. It is a silicated sandstone, very homogeneous and sound, and saws well. We know nothing personally of its behaviour in our climate, but it has all the promise of an enduring material, and its power of resistance is very great, Kirkaldy's test proving that it requires a pressure of 693 tons per square foot to crush it. The colour is bluish grey.

ON THE CAUSE OF MORTALITY FROM FOGS.

IN the *Builder* of January 24, 1874, I endeavoured to account for the peculiarities of London fogs, which were then the supposed cause of the excessive death-rate about the time of the previous Cattle-show; and as public attention is again attracted to the subject by the late fearful mortality, attributed in the Registrar-General's report to low temperature and dense fogs, I again venture a few remarks upon it.

My former was an endeavour to account for the prevalence of such fogs; but in my present paper I shall endeavour more especially to show a cause for the mortality which results from them. This, I believe, is very frequently attributed to soot and other matter brought down from the air, which, floating in the fogs, is taken into the lungs by inhalation. I know of no proof that the London air is so loaded with deleterious matter. Doubtless, there is much soot suspended in it at all times, but as chimney-sweepers are not particularly short-lived, soot cannot be very injurious to health, and we must look further for the cause of the late excessive mortality.

What are fogs? Teachers of meteorological science tell us that they are formed of particles of water condensed by cold from invisible vapour, or water-gas; but as water is 800 times heavier than the air, it is obvious that to keep them floating, either as fog or cloud, each particle must occupy about 800 times the space of its own bulk as water.

My own theory, which I have long endeavoured to advance, is that as electricity coats the surface of all bodies, and has no weight, the particles of water, being so minute when detached from every other particle, become sufficiently buoyant to be wafted about in the lower air, but their capacity for electricity increasing with their temperature, they rise into the air in accordance with this increase, but sink again or form rain on becoming cool, from the loss of their surcharge of electricity in accordance with the conducting or non-conducting condition of the atmosphere.

I cannot herein fairly explain the theory, although I would gladly avail myself of an opportunity for doing so, but in accordance with it I consider a fog as particles of water, each of which is surrounded and supported by its coating of electricity, the atmospheric air being in an inverse ratio to the density of the fog; and I believe the insufficiency of the air inhaled in breathing under such conditions is the chief cause of their injurious effects.

Perhaps members of the medical profession in London may think this opinion worthy of consideration. The ill-health at such times certainly is not the effect of excess of moisture, as of this there is ample proof. In my pamphlet "On the Effects of Elevation and Floods on Health" (1866), I have shown that the Western counties situations, occupations, and seasons are, as a rule, by far the most healthy, and the latter was clearly shown by the very low death-rate during the late excessively wet summer.

G. A. ROWELL.

CASES UNDER METROPOLITAN BUILDING ACT.

FOUNDATIONS: "VIRGIN SOIL."

John Kember, a builder, of Gayford-road, Starch-green, appeared, before Mr. Paget, at the Hammersmith Police Court, to answer an adjourned summons, at the instance of Mr. Knightley, district surveyor of Hammersmith, for commencing to build houses without covering the site with a layer of concrete, contrary to the bye-laws made by the Metropolitan Board under the Amended Act of 1878.

The bye-law in question provides that the site of every house or building shall be covered with a layer of good concrete at least 6 in. thick, unless the site thereof be gravel, sand, or natural virgin soil.

Mr. Knightley said the question for the magistrate to consider was, what was the meaning of "virgin soil?" It had been considered by the Association of District Surveyors, who agreed that it meant soil in a natural position, which had not been disturbed or cultivated. He contended that the bye-laws contemplated virgin soil to mean soil which had not been disturbed even by a plough, and mentioned that it was contemplated to build St. Paul's new schools in the neighbourhood upon land which had been used for market-gardening purposes. There had been a quantity of animal matter mixed with that land, and he should not think it the right soil to build

upon unless the site was covered with concrete. The land upon which the defendant had erected his houses been used for brickmaking and the clay excavated. There had since been accretions which formed the site, and therefore the houses had not been built upon virgin soil. It was necessary to have such a site sealed with concrete, to prevent the fires pumping up the unwholesome emanations into the houses. He also mentioned that the outcome of a conference of suburban builders with Mr. Cross, the Home Secretary, was the list of bye-laws, and said, therefore, practically they were made with their consent.

Mr. Kisch, who appeared for the defendant, said the land was formerly a grass field, 3 ft. of which had been excavated, but it had not been filled in. His defence was that the site consisted of the virgin soil.

Mr. Knightley disputed that statement, and produced a specimen of the land which had been taken from an adjoining site. He called Mr. Stephens, his clerk, who said that the excavations had been filled up with brick rubbish, &c. He was present before the floors were laid, and the ground appeared to correspond with the specimens produced.

Mr. Kisch produced a sample of land, which his witnesses had dug up, consisting of clay, sand, and gravel, in support of his defence that it was virgin soil.

Mr. Paget, after hearing witnesses on both sides, decided that it was not virgin soil, and made an order for the site to be covered with concrete in fourteen days.

STAINED GLASS.

Sedbergh.—A welcome addition has lately been made to the south aisle of Sedbergh Church by the insertion of a four-light window containing groups in rich colouring of the following subjects,—"The Visitation," "The Naming of St. John," "St. John taking leave of his Parents," and the "Noli me Tangere," whereas the upper and lower portions of the lights are treated in a delicate but simple pattern, entirely in white, thus acting as a foil to the richness of the groups. The window is a memorial one, and an inscription at the base of the four lights records the names, ages, and dates of death of those commemorated. The work is by Messrs. John Hardman & Co., of London and Birmingham.

Erith.—Messrs. John Hardman & Co. have also just filled the fourth of the large single lancet-light apse windows of Christ Church with stained glass. The window in question is on the north side, and the second one from the centre. The subjects represented are the Nativity, Presentation, Adoration of the Magi, Flight into Egypt, and Finding in the Temple. The groups are contained in medallions of geometrical form, the spandrels between them being composed of richly-coloured diapered work, characteristic of strictly thirteenth-century glass.

Stafford.—A third three-light Munich window, by Messrs. Mayer & Co., has just been erected in the parish church of Stafford. It is the gift of an anonymous donor.

Books.

The Life and Work of St. Paul. By F. W. Farrar, D.D., F.R.S. With Coloured Maps. London, &c.: Cassell, Petter, Galpin, & Co.

Biography has of late years assumed great importance in English literature. Works of signal interest and importance, in the form of memoirs, of lives, or of remains, have frequently issued from the press. The reader has been admitted to glance at the inner life of courts and sovereigns. The memoirs of the Prince Consort, the lives of Dean Hook and Bishop Wilberforce, the recollections of Prince Metternich, the conversations of Mr. Senior, and the memoirs of Mdme. de Rémusat, have placed at the disposal of the ordinary reader many of those important minutiæ which have generally been reserved for the investigation of the historian. In works of this nature, to the interest of a tale is added the greater claim on the attention that the tale not only concerns persons who have been the makers of history, but that it is to be received as true.

In accordance with the bent of the public taste, religious writers have bethought themselves that it might be well to reproduce the history of the persons and events that were contemporary with the cradle of the Christian faith, in somewhat of a biographical form. That they have accurately gauged the public taste is evident by the large circulation already attained by several of these recent works. Canon Farrar's Life of St. Paul, now before us, has reached the seventh edition.

It is not for a moment suggested that any new incidents of personal history are thus brought before the world. The attempt of the writers is to give a picturesque clothing to a well-known tale. As to what further may be their aim, as religious writers, it is not for us here to discuss. Two sources of fresh illustration are open to a brilliant writer. One of these consists in obtaining all the information that may be collected by visiting the scenes of the history of which he writes. A local colour may thus be given to the narrative, while the incidents of scenery, archæology, climate, and manners and habits of the people are such as to throw on well-known records a light that is at once novel and truthful.

Canon Farrar's readers will regret that he found cause to lay aside his original intention of tracing the footsteps of St. Paul, and of thus giving to his work that local colour of which we speak. Failing thus in any new material for æsthetic or archæological remark, we must turn our attention to the purely literary character of the work.

As to this, there can be no doubt that as wide and as rich a field is open for the scholar as is thus afforded to the observer by local research. There exists a singularly full body of Jewish literature, of the utmost importance for the understanding of both the Old and the New Testaments, which has been almost as much neglected as if it were written in hieroglyphic or in cuneiform. Very much of this, it is true, is accessible only to the scholar who can read a very cramped Hebrew, or who is content to take the extracts or the translations of German writers. But the most important portion of this literature is brought within the reach of the humblest scholar by what Dr. Farrar justly calls the magnificent work of Surenhuse; a book of which Dr. Adam Clark wrote that no theological library was complete without it. This great work, published at Amsterdam in 1620, contains the sixty-three tracts of the Mishna, or oral law of the Jews, in the original Hebrew; a Latin translation, and the commentaries of the great Rabbi Moses Ben Maimon, or Maimonides, who was called the second Moses, as well as of Bartenora, and occasionally of other writers.

The great defect of most writers who have at all drawn on this mine of ancient learning is that they speak of the "Talmud" as a book, and cite it indifferently by the folio of the Hebrew edition. The Talmud is a library rather than a book. Under that name are comprised separate portions which may be compared to our own statute-book, Blackstone's "Commentaries," Bunyan's works, and "Hudibras." Unfortunately, writers have been too apt to quote from the Haggadistic, or folk-lore and poetical portions of the Talmud, which are chiefly contained in the Gemara, or comment on the Mishna; their attention being usually exerted in proportion to the wildness of the story. Thus the primary importance of those treatises which contain the definite Synhedral law of the Jews, and of which the chronology is for the most part clearly fixed by the names of the Rabbis who are cited, has been grievously overlooked. English literature has yet to commence its proper study of the Talmud.

Two main questions present themselves for the solution of the historian of St. Paul. These are, his relation to the Jewish law, and his relation to the invisible world. For the study of the first, the chief requisite is to understand distinctly what the orthodox Jew of the first century actually was. Certain points, which at a later period became defined by the Sanhedrim, were at that time in dispute. Such, for instance, were the minute regulations as to washing the hands. These are referred to in the Gospels. They are contained in the tract Yadaim of the Talmud. They were observed by the Pharisees in the time of St. Paul, but they were not then legally binding. The question whether St. Paul had for himself thrown off the obligation of the law must decide the meaning of many passages in his Epistles. According to the Acts of the Apostles, he claimed to the latest period to have done nothing contrary to the customs of the fathers. As to this, as St. Paul himself admits, there can be no question of more or less. The slightest obligation of the law was as sacred as the most important. Canon Farrar speaks of St. Paul as a Haggadist, and there is no doubt that he makes use of this portion of the learning of his age. But the picture of the educated Jew, who walked in all the commandments and ordinances of the law blameless, and who yet saw in Jesus the Light of Israel, is one that has yet to be drawn.

With regard to the relation which St. Paul bore, or represented himself to bear, to the invisible world, a familiarity with the Holy Land of to-day, and with the habits of thought of the Semitic race, show how difficult is is for the Englishman of the nineteenth century rightly to comprehend the feelings of the Jew of the first century. In that climate, and with people of that blood, what we call the supernatural is a part of daily life. For a man to tell his fellow that an angel had spoken to him would excite neither wonder nor doubt. And one very special point to remember is, that the addition of the words "in a dream," which to us would make an extraordinary difference, would make none whatever to the Arab. "What was that to do with it?" he would say, "God sends his message as he will." We do not refer to this characteristic view of the Eastern people as in any way detracting from any claim to supernatural light or guidance, whenever this may be distinctly expressed. But we cannot hesitate to hold, that while an adequate knowledge of the exact state of the Jewish law at the time of Christ is essential to a thorough literary comprehension of any book of the New Testament, so a knowledge of the emotional or imaginative mode in which the supernatural was and is regarded by the Eastern Jew is no less necessary to the appreciation of the character of any prophet or apostle. We therefore anticipate that Dr. Farrar's book, far from concluding the inquiry, will be but the first of a new series of investigations and of discussions. Mean time that he commands the attention of the public in an extraordinary way is proved by the demand for edition after edition of his work.

As a piece of writing it is deeply interesting, and few will begin it without reading it through.

VARIORUM.

Mr. J. O. Halliwell-Phillipps has materially strengthened his argument in favour of spelling the name of our greatest poet with the additional *e* after *k*,—"Shakespeare," in "A Few Additional Words on the Momentous Question respecting the E and the A in the name of our National Dramatist." We quite agree with him that there ought to be uniformity in this matter. It is surely time we arrived at a determination concerning it. Our own argument has been that while we receive the name as Shake-speare in pronunciation, the poet has not used the *e* after the *k* in any of his signatures remaining to us. The suggestion now is that in one of the signatures to the will the character following the letter *k* is the then well-known and accepted contraction for *es*. This, if established, should suffice to settle the matter. The objection that will probably be taken is the infrequency of the use of that contraction anywhere but at the *end* of a word. If, however, we remember that in some of the dedications the word is divided by a hyphen, its introduction before the hyphen might be accepted as probable.——Mitchell & Co.'s "Newspaper Press Directory for 1880,"—the thirty-fifth annual issue,—may rightly be called "The Advertiser's Guide." It has grown greatly in size, and gives a remarkable picture of the newspapers and other periodicals published in the United Kingdom. In London and the provinces, 1429 newspapers are now published regularly.——Lockwood's "Builder's and Contractor's Price-Book for 1880," includes the new bye-laws recently made by the Metropolitan Board of Works, and the whole has been freshly revised by Mr. Fras. T. W. Miller.

Miscellanea.

Liabilities of Builders' Foremen.—A new vicarage, erected at Chatteris, was the subject of two actions heard in the March County Court on the 17th inst., and reported in the *Cambridge Chronicle*. It seems that the contractor for the erection of the building went into liquidation last October, and since then a number of claims, stated to amount to upwards of 100*l*., have been made upon Mr. Richardson, the foreman of the works, on the ground that he had ordered materials for the carrying on of the contract, and that credit was given to him and not to the contractor. Two test actions were brought for the purpose of settling the question; the one by Mr. Thomas, lime-merchant, and the other by Messrs. Coote & Sons, coal-merchants, and each against Mr. Richardson. In the end, Mr. Bennett, Q.C., the judge, decided both cases in favour of the defendant, and with costs.

Royal Institute of British Architects.—At the sixth meeting of the present session, held on Monday evening last, Mr. J. Whichcord, president, in the chair, the secretary, Mr. W. H. White, announced the death of M. J. P. Cluysenaar, who died at Brussels on the 16th inst. at the age of 68. He had been an Honorary and Corresponding Member of the Institute since 1853. It was also announced that at the special general meeting, to be held on the 8th proximo, Mr. T. Porter will move the following resolution:—"That the Council of the Royal Institute of British Architects be requested to appoint a committee to take into consideration the subject of architectural competitions, that shall, in concert with other London and provincial societies, suggest certain regulations for the conduct of architectural competitions, and report to the Council the result of their action." The following new members were balloted for and declared to be elected, viz.,—as *Fellow*: Mr. E. W. Stephens, of Maidstone; and as *Associates*: Messrs. Arthur Cawston, W. G. Cooke, J. E. K. Cutts, and Percival Currey, all of London. Mr. Henry Faija then read a paper on Portland Cement, which we print, but defer our report of the discussion until next week.

Halifax School of Art.—The annual distribution of medals, prizes, and certificates to the students of this school took place on the 19th inst., Mr. H. C. McCrea, J.P., presiding. Mr. Stopford, master of the school, read a short report of the work done. The evening classes, he remarked, were very successful, the total number of students being seventy, with an average attendance of fifty. In the National Art competition the school obtained one silver medal, two bronze medals, one Queen's prize of books, and six students obtained third-grade prizes. Five students obtained prizes at the local examinations, five obtained full certificates, and twenty-three ordinary certificates. In the high or advanced examinations, three were successful in designing, one paper being marked "good," and four passed in building construction. Out of 142 schools in the kingdom, Halifax stood tenth as regards results. The chairman, in the course of his address, called attention to the very inadequate and unsuitable premises in which the work of the school is carried on, and enforced his plea for better accommodation by offering to give 500*l.* towards the erection of a new building.

The Tay Bridge.—At the last meeting of the Glasgow Institute of Engineers, a paper on the Construction of the Tay Bridge was read by Mr. John St. Vincent Day, who gave an account of the observations made by himself and a number of members of the Institute of the remains of the bridge, stating that these showed that in some instances the bridge was not only defective in design, but inferior in workmanship. He explained that the castings showed in several places that they had been poured too cold, were irregular in thickness, and in some cases the castings were found with blow-holes which had been filled with lead. In Mr. Day's opinion, some person engaged in the work must have been cognisant during the whole life of the bridge of at least one vital element of its insecurity. He also pointed out that the flanges of the piers had not been properly brought together, as in one case the inspecting party had found a space of 14 in. where the concrete had spread out between the flanges. A headless bolt which had been painted over was also found.

The Sunday Society.—The committee of this society have arranged for an evening party, similar to that which took place during the presidency of Dean Stanley, believing that this will not only be a pleasant gathering of the friends of the society, but will aid in furthering its objects. The party will be held at Willis's Rooms, on Tuesday, March 16th, and will, as before, be confined to the members and their immediate friends. The proceedings will commence at half-past eight o'clock, with addresses, in the large hall, Sir Henry Thompson presiding, after which a *conversazione* will be held, and musical selections for promenade and dancing will be given.

Harris's Patent Windows.—It will be seen, on reference to our advertisement pages, that these windows, which appear to have met with the approval of architects and builders, can now be obtained of Messrs Whenman & Co., 90, Cannon-street, who have taken to the business lately carried on by Mr. Harris.

Spelthorne Sanatorium.—This institution, established for the reformation of women who have fallen into habits of intemperance, is now in work. The committee, an excellent one, has issued its first annual report, from which we learn that since the opening, on the 1st of January last year, twenty-two patients have been admitted, all voluntary, and all paying towards their maintenance, sixteen being the present number. The home is worked by a lady superintendent, an assistant lady, and a matron. With laundry work, a workroom, and the general management of the house, a smaller staff could not efficiently exercise the necessary control and supervision; and it is to the lady superintendent's conscientious and untiring devotion to the work that much of the discipline and good tone existing in the home is due. Those who have watched this work from the beginning are struck by the improvement in appearance and bearing, which is soon evident in the patients. The home can accommodate twenty-two, and several more could be received with a comparatively small outlay. Donations are much required to meet the expense of adapting and furnishing available space. The annual expense is 200*l.* in excess of the patients' payments. The laundry and workroom, it is confidently expected, will furnish part of this sum, and the remainder, it is hoped, will be met by yearly subscriptions. Miss Helena Antrobus, of 14, Kensington Palace-gardens, is the honorary secretary, and would give any information required.

Compensation Case.—A compensation case, in which the claimant was Mr. W. H. Davies, cooper, St. Martin's-lane, and the defendants the Metropolitan Board of Works, was heard on the 23rd inst., at the Sessions House, Westminster, before Mr. Montague Turner, deputy high bailiff, and a special jury. The claim sent in was for 4,328*l.*, viz.,—3,328*l.* for leasehold interest, and 1,000*l.* for goodwill; and the amount that had been offered in settlement by the Metropolitan Board was 500*l.* The premises in question consist of a cooperage and a dwelling-house in West-street, Soho, let to weekly tenants, and are required by the Board of Works for the new street from Charing-cross to Tottenham-court-road. The witnesses for the claimant did not bring their valuations up to the nominal claim sent in. Mr. R. Bonny and Mr. S. Chadwick, surveyors, estimated the value of the property at 1,300*l.*, and the goodwill of the business and loss by removal at three years' purchase, 900*l.*, making 2,200*l.* The Deputy High Bailiff carefully summed up the evidence, and the jury, after a short deliberation, found a verdict for 1,500*l.*

Stand-Pipe.—An enormous metallic reservoir or stand-pipe, said to be the largest in existence, has been lately furnished to the New York Waterworks by the Cunningham Ironworks of Boston. This structure is 150 ft. in height and 6 ft. in diameter. The first 50 ft. from the foundation is constructed of ½-in. metal, the next 50 ft. is of ⅜-in. metal, and the remaining portion of $\frac{5}{16}$-in. metal. This is double riveted on the round-about seams, these seams being strengthened on the inside by strips of ½-in. metal, 6 in. in width, and the edges of the plates are nicely planed, so that they will match, not lap, as is usually the case when they are thus riveted to the inside strip. The stand-pipe rests upon a cast-iron foundation, weighing 18 tons, which in turn rests upon a stone foundation, measuring 15 ft. square. Around the pipe is built a circular wall of brick, 2 ft. in thickness, the distance between the wall and the stand-pipe being also 2 ft. This brick wall contains windows at intervals of about 10 ft., which give light to a spiral staircase which winds round the pipe to the top of the structure. There are thirty-two courses of plates in this pipe, and the weight is 60 tons.—*Commercial Bulletin.*

Millers' International Exhibition.—Particulars and conditions of the first Millers' International Exhibition, to be held in Cincinnati, U.S., in June next, under the auspices of the Millers' National Association, have reached us. The exhibits will be divided into eleven classes, and will comprise all kinds of milling and mill machinery, millers' "supplies," products of the mill, bread, &c. The premiums offered in the various classes are numerous, and an interesting feature of the exhibition will be a series of test trials of steam-engines. Objects for exhibition must be delivered at the Exhibition building between the 17th and the 31st of May, both days inclusive.

The Peabody Fund.—The fifteenth annual report of the trustees of the Peabody Donation Fund has just been issued. The net gain of the year has been 24,786*l.* 8*s.* The sum given and bequeathed by Mr. Peabody was, in in 1862, 150,000*l.*; in 1866, 100,000*l.*; in 1868, 100,000*l.*; and in 1873, 150,000*l.*; making a total of 500,000*l.*; to which has been added money received for rent and interest, 223,917*l.* 5*s.* 4*d.*, making the total fund on the 31st December last, 723,917*l.* 5*s.* 4*d.* Of this amount there was spent, to the end of 1879, the sum of 549,984*l.* 14*s.* 3*d.*, thus leaving in the hands of the trustees at that time 173,932*l.* 11*s.* 1*d.* The trustees have made arrangements for the purpose of acquiring from the Board of Works six plots, covering an area of over nine acres, and situated in the following localities: Glasshouse-street, near the Mint; Whitecross-street, St. Luke's; Bedfordbury; Great Wild-street, Drury-lane; Pear Tree-court, Clerkenwell; and Old Pye-street, Westminster. The agreement for above purchases is now on the point of completion, and the price paid will be, including all expenses, about 100,000*l.* To cover these sites with buildings of the character hitherto erected by the trustees, will involve an expenditure which cannot fall short of 360,000*l.* In order to meet this outlay, which, though ultimately remunerative, is beyond the present means of the trustees, they have obtained from the Treasury a loan of 300,000*l.* at 3½ per cent. The death-rate in the Peabody-buildings, during the past year was 20·9 per 1,000, which is about 3·21 in a thousand below the average of all London for the same period. The average rent of each dwelling was 4*s.* 4½*d.* per week, and of each room, 1*s.* 11½*d.*

Girton Church has just been almost entirely rebuilt. The roofs, floors, benches, pulpit, lectern, and porch are new. The floor level has been raised considerably. The windows are glazed in various tints; the warming is effected by one of Musgrave's slow-combustion stoves, the doors are of oak, the roofs of pitch-pine, the rafters of deal, and the spaces between are plastered in the nave and boarded in the chancel. Minton's tiles are used for the floors in the chancel, and the best of the old floor-bricks for the alleys in the nave. The gables have stone copings and crosses, a stone bellcote terminates the east end of the nave, the roofs are covered with Westmoreland slates, and the walls are built with blue lias stone from Collingham pits. The chancel has been built at the expense of the Ecclesiastical Commissioners, under the direction of their architect, Mr. Ewan Christian, of London. Mr. H. M. Townsend, of Peterborough, was the architect for the nave. Mr. R. Young, of Lincoln, was the builder.

National Association of Master Builders. The Council of this Association held a special meeting at Derby on the 17th inst., to take into consideration the Bill now before the House of Lords entitled the Employers' Liability Act, 1880. The meeting was attended by representatives from London, Birmingham, Liverpool, Manchester, Lincoln, Huddersfield, Nottingham, Leicester, Leeds, &c. A deputation was appointed to give evidence before the Select Committee of the House of Lords and oppose the Bill as it at present stands.

Messrs. Holland & Hannen having completed a large mansion in Seamore-place, Mayfair, from the designs of Mr. E. A. Grüning, as a residence for Mr. A. C. Guthrie, the foremen and principal workmen, numbering about fifty, were treated by Mr. Guthrie to a dinner at Anderton's Hotel, Fleet-street, on Tuesday evening, the 24th inst., under the presidency of Mr. C. V. Hunter, who has acted as clerk of works, and Mr. W. J. Pickard, the general foreman.

School of Art Building, Kidderminster. Mr. Rupert Kettle, Q.C., recently distributed the prizes to the successful students of the Kidderminster School of Art. At the outset of his address he congratulated the inhabitants upon being provided, by the munificence of some of their fellow-townsmen, with the handsome and commodious new building which has lately been erected for the School of Art, and of which Mr. J. M. Gething is the architect.

Reynolds & Co.'s Metal Ribbon Blinds. These deserve to be looked at. The amount of architectural and geometrical design obtainable is remarkable. They are very strong, and admit of coloured decoration. The invention would seem to be applicable to many different objects.

TENDERS

For farm-house at Sherfield English, near Romsey, Hants, for Mr. James Lockhart. Messrs. Bailey, Norman, & Brown, architects:—

Gay	£758	0	0 !
Green	597	10	0
Crook	589	0	0
Collins	572	15	10
Jenkins & Sons	568	4	4
Mordaunt	565	0	0
Crook	529	0	0
Mitchell & Wort	490	2	10
Petty	480	0	0
Wheeler, jun	470	0	0
Egg & Hobbs	462	13	5 !

For the erection of mission-hall, Royal-road, Ramsgate. Mr. Alfred B. Pite, architect. Quantities supplied by Mr. Joseph Rookwood:—

Forwalk	£985	0	0
Duckett	957	0	0
Goodman	950	0	0
Horne	930	0	0
Elgar	880	0	0
Martin	810	0	0
Paramor & Son	770	0	0
Mitchell	640	0	0

For pulling down and rebuilding the Olive Branch public-house, Hackney-road, for Mr. W. Fieldhouse. Mr. J. G. Needham, architect:—

Pringle	£1,783	0	0
Wire	1,770	0	0
Edwards	1,735	0	0
Marr	1,699	0	0
Hawkings	1,645	0	0

For Mountsorrel North and Mountsorrel South drainage. Messrs. Hodson, Price, & Hodson, engineers:—

Barnes	£3,400	0	0
Palmer	3,045	16	2
Bingham	2,623	0	0
Fotherby & Son	2,597	15	1
Smart (accepted)	2,245	0	0

For drainage, Wymeswold, Leicestershire. Messrs. Hodson, Price, & Hodson, engineers:—

Sharman	£2,630	0	0
Faulkes	2,490	0	0
Barnes	2,390	0	0
Palmer	2,081	2	9
Smart	1,973	10	0
Bingham	1,859	0	0
Fotherby & Son (accepted)	1,8 9	7	11
Wootton	1,794	19	2

For sewerage, Much Hadham. Messrs. Smith & Austin, civil engineers:—

Blackmore & Bath	£3,984	0	0 !
Field	3,350	0	0
Sabey & Son	3,163	0	0
Glasscock	2,911	0	0
Pizzey	2,899	14	10
Bell	2,835	0	0
Walker	2,759	0	0
Marriott	2,747	0	0
Cowdery & Sons	2,702	0	0
Pollard	2,589	0	0
Gibbons & Co.	2,559	0	0
McKenzie	2,500	0	0
Rowley	2,399	0	0
Champness	2,380	0	0
Gray	2,357	10	0
Bingham	2,347	0	0
Cook & Bennett	2,266	0	0
Arber & Son	2,220	0	0
Young & Williams	2,150	0	0
Carders	2,150	0	0
S. & W. Pattinson	2,131	10	0
Coker (accepted)	1,885	2	8½ !

For alterations and general repairs to 16, Fitzroy-square, for the Home Hospitals Association. Mr. Ernest Turner, architect. Quantities supplied:—

McLachlan & Sons	£1,444	0	0
Wontner Smith & Co.	1,440	0	0
Tyerman	1,390	0	0
Patman & Fotheringham	1,385	0	0

For alterations and general repairs to the Horns Tavern and Assembly Rooms, Kennington. Mr. F. Edwards, architect:—

Patrick & Son	£924	0	0
Langmead & Way	880	0	0
McLachlan & Sons	668	0	0
Gerrard	641	0	0

For the erection of new offices and warehouse, St. Thomas-street, Borough, for Messrs. De Clermont. Mr. William Wimble, architect:—

Ashby & Horner	£10,180	0	0
McLachlan & Sons	9,797	0	0
Colls & Sons	9,788	0	0
Lawrence	9,756	0	0
Brass	9,553	0	0
Faulkner	9,393	0	0
Scrivener & Co.	9,359	0	0
Morter	9,232	0	0
W. & F. Croaker	8,618	0	0

For main drainage, Sileby, Leicestershire. Messrs. Hodson, Price, & Hodson, engineers:—

Barnes	£4,400	0	0
Faulks	4,160	0	0
Palmer	3,958	18	0
Bingham	3,609	0	0
Biggs	3,273	0	0
Smart	3,200	0	0
Fetherby & Son (accepted)	3,173	15	11

For alterations, &c., to the Dolphin public-house, Oxford-street. Mr. Cotton, architect:—

Toms	£637	0	0
McLachlan & Sons	572	0	0
Foxley	435	0	0

For alterations and additions to Bekesbourne Vicarage, Canterbury. Messrs. Habershon & Fawckner, architects:—

Wilson	£871	0	0
Sargent & Son	666	10	0
Gaskin	654	0	0
Reading	650	0	0
Castles	649	0	0
Beale	576	0	0
Fird	548	10	0

For completion of eastern side of cloisters at St. Marychurch, Torquay. Messrs. Hansom & Son, architects:—

Eddles (accepted)	£297	4	0

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